American Machinist

ESTABLISHED 1877

McGRAW-HILL PUBLISHING COMPANY, INC.

New York, February 4, 1932

VOL. 76 No. 5

Machine Swaging as a Modern Art

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Assistant Editor

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"Swaging? Oh yes. That's the process for pointing pins and making brass beads," the shop man would have said 10 or 15 years ago. Not so today. Tapered rods and tubular parts, necked parts, assemblies — diameters up to 9 in. — are produced in wide variety and in many metals. Some jobs cannot be done any other way, and the saving in material on the majority of them will pay for the operation. This article, the first of three, defines the art of swaging, discusses the construction and operation of rotary swaging machines and the fixtures employed

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SWAGING undoubtedly would be used more extensively if its advantages were more generally understood. It is an old art and is employed for a variety of work—from pointing pins for jewelry to forming axle tubes 5 in. or more in diameter. Many shop men are not familiar with the process or with the various types of machines available. In consequence, metal is often cut away and wasted where, with no increase and often with a decrease in labor, it could be saved by swaging.

What, then, is swaging? What are its advantages? What types of machines are employed? And what classes of work are made by swaging? These and other related questions are discussed by this article and by two more to follow it.

As treated here, swaging involves striking many very short blows to produce the desired effect. Cold forming or finishing at a single blow, as in coining in a knuckle-joint press, is sometimes called swaging, but it is really a different process.

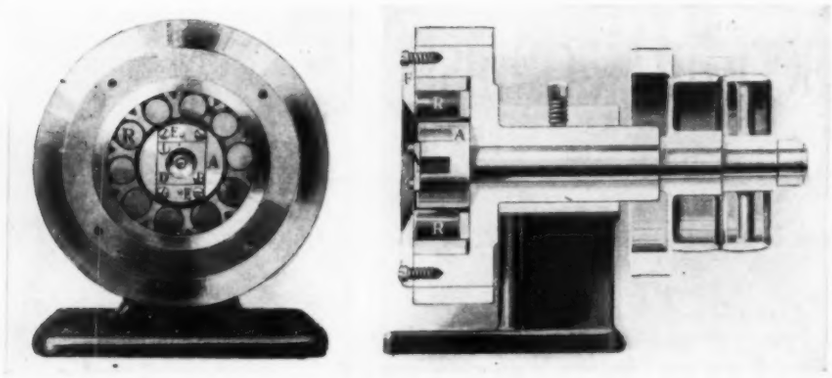
Aside from savings in labor and material, swaging improves the structure of the metal. It makes it stronger, harder, more dense, and more elastic. It gives the work a burnished surface which is more resistant to wear and to corrosion than the parent metal. Moreover, parts made by swaging can be held within limits of plus or minus two to three thousandths of an inch in diameter, and in some cases can be turned out on fully- or semi-automatic machines at a high production rate.

Most swaged parts are made either from round wire, bar stock, or tubing, but stock which is square or that has more than four sides can be hammered or drawn into circular section. Previously formed blanks, such as drawn shells with one end closed, can be swaged without difficulty. Almost any ductile material can be swaged, but soft materials that do not work-harden rapidly naturally lend themselves to more rapid working than do materials without these qualities.

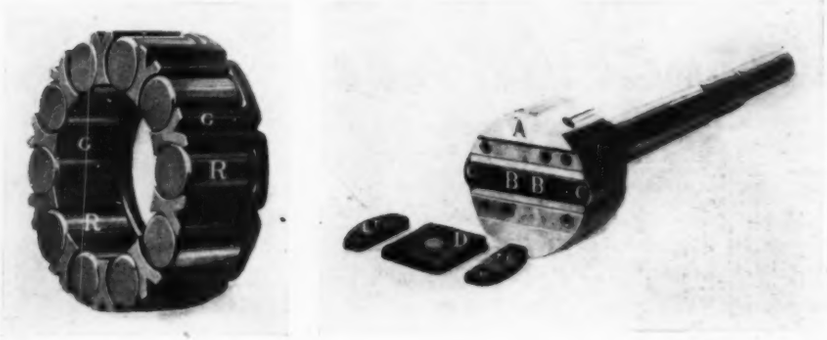
Besides the manufacture of parts, the swaging process is used for pointing the ends of rods or tubes to permit them to be entered into drawing dies. The process is also employed in place of drawing dies for reducing the section of wire, particularly in the manufacture of gold-filled wire for the jewelry trade.

In order to appreciate the swaging process as applied to various types of work discussed later, it will be best to consider first a typical machine. Two classes of swaging machines are built—rotary and reciprocating. Rotary machines strike up to 5,000 blows per min.; reciprocating machines strike several hundred blows per min. Rotary machines are most widely used and are described first, together with the types of work done on them.

Rotary swaging is a process of forging or hammering whereby metal is reduced in section or drawn down on a taper by striking rapid blows with a pair of dies, which usually revolve, and which have faces machined to the desired shape. Machines available may be equipped with two dies, three dies or four dies, in accordance with the ideas of the manufacturer concerned. Although



Face and section of a typical small Torrington rotary swaging machine. The upset end of the spindle *A* carries the die blocks *B* and the backers *C*, the latter being forced inward by the rollers *R* as the spindle rotates



Roller cage *G* and the spindle assembly. The backers and the dies are held in place in the spindle slot by plates *D* and *E*

variations in construction are to be met with in machines by different manufacturers, the principle of operation is much the same.

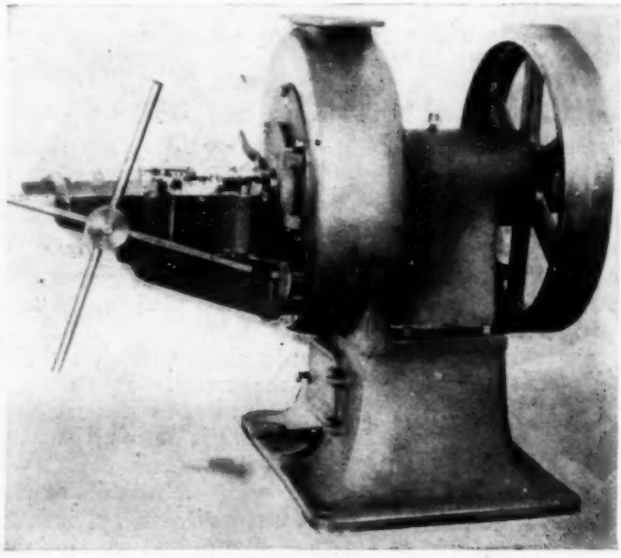
A face view and a longitudinal section through a typical small swaging machine are illustrated. A perspective of the roll face and the spindle assembly are also shown. The spindle *A* is bored for its entire length to permit passing the work entirely through when only a reduction in diameter is contemplated. At the front of the spindle is an enlarged portion that is slotted to receive the dies *B* and the backers or hammers *C*. Plates *D* and *E* hold the dies and backers in place. The spindle is driven by tight and loose pulleys in this particular machine and a flywheel is added. A roll cage *G* surrounds the large end of the spindle and is itself free to rotate or creep within the hardened steel ring. Most manufacturers employ the free cage construction, feeling that the wear and the power consumed are reduced. On the other hand, claims advanced for rigid roll cage construction embrace: higher velocity blows; shorter contact between the dies and the work, and therefore less drag of the dies and tendency to twist the work.

The work, which may be solid or tubular, is pushed into the die opening. As the spindle is rotated, the backers and dies are thrown outward by centrifugal force. But after a small angular displacement of the spindle, the backers come in contact with the rolls and are forced inward smartly against the dies. The dies in turn strike or squeeze the work and effect a reduction in section. As the work is shoved farther into the dies, a progressive reduction in section takes place, and the metal must flow axially to increase the total length to compensate for the metal displaced.

As compared to two-die machines, those having four dies are said to increase materially the amount of reduction possible in a given time, but one maker of the four-die type does not recommend using four dies for work smaller than $\frac{5}{16}$ in. in diameter, because of resulting die weakness. Four-die machines of a given size perform considerably heavier operations than two-die machines of the same size, but with some sacrifice in accuracy and finish, according to one maker of both types of machines. About 25 per cent more power is usually required for four-die machines than for the two-die type.

So-called "open die," or self-opening diehead machines, also of the rotary type, are used to swage a neck between two sections of larger diameter. In such machines, the die has to open enough to load and discharge the work, but performs the same function as closed dies in doing the swaging operation itself.

Small diameter work may be fed to rotary swaging machines by hand—medium size work likewise, if the angle at the mouth of the dies is not so large as to cause "kick-back." Often a slight kick-back can be remedied by removing all traces of oil on cold work and coating the end with chalk. Hand fed work will be more accurate if the cover plate is fitted with a guide bushing concentric with the axis of the machine. This bushing is made with a bore from 0.010 to 0.031 in. larger than

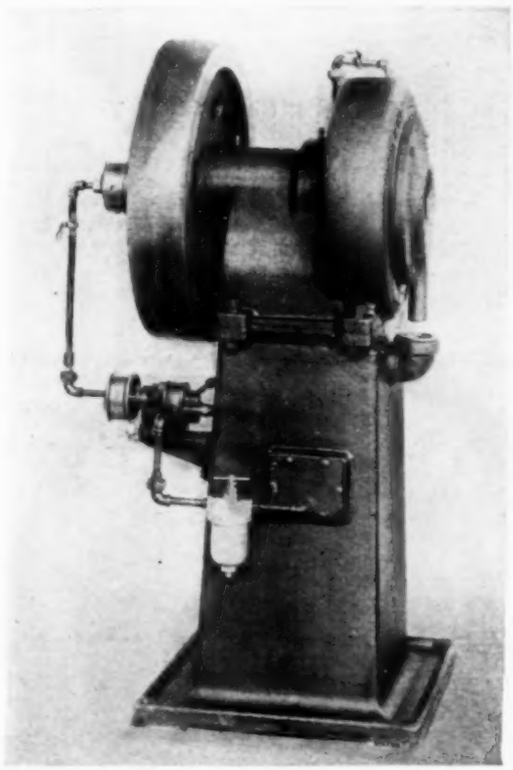


Rack and pinion feed applied to a Waterbury-Farrell rotary swager

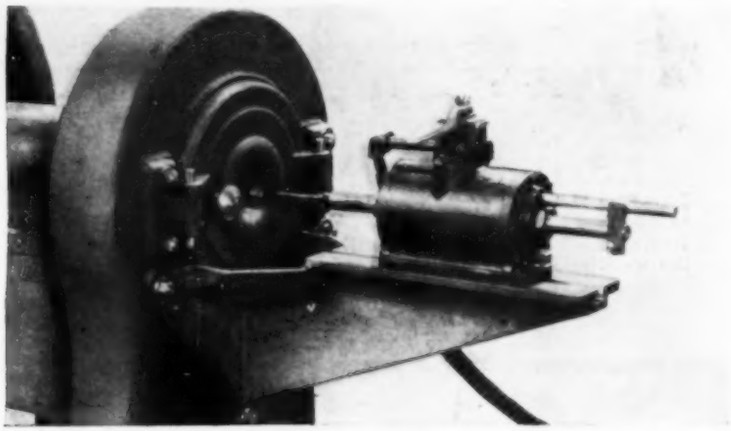
the stock. On long work where inaccuracy of feeding is probable, it is common practice to use a sliding workhead to line up the work with the die opening. The workhead may be fitted with a rack and handwheel or with pneumatic or hydraulic cylinders. The last two may be semi-automatic or fully automatic in action. One manufacturer grips the work in a chuck on the power fixture in such a manner that the work is permitted to turn slowly in order not to mar the finish. A brake is fitted to the rotatable chuck body so that the work will revolve at about the same speed as is common when the stock is held by hand.

Fully automatic rotary swaging machines, especially of the self-closing type, are employed for swaging wire wheel spokes, eyeglass temple butts, and similar parts directly from coils of wire. Sometimes the wire is put through a straightener before it is fed through the hollow spindle of the machine. Finally, the piece is cut off to proper length after it has passed through the swaging head. Other fully automatic machines are employed for making taper pins, needles and the like, as well as for reducing the diameter of wire, including tungsten wire, which must be worked hot.

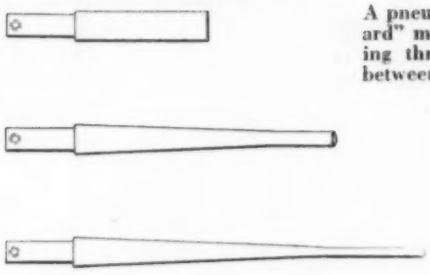
Some rotary swaging machines are provided with two independent lubricating systems. One feeds relatively light oil, sometimes by the use of chain oilers, or sight-feed oilers, to the spindle bearings. The second supplies heavy steam engine oil or soluble oil to the head rolls, hammer blocks and dies by means of a gear pump or a sight-feed oiler. The heavy oil must have a high flash



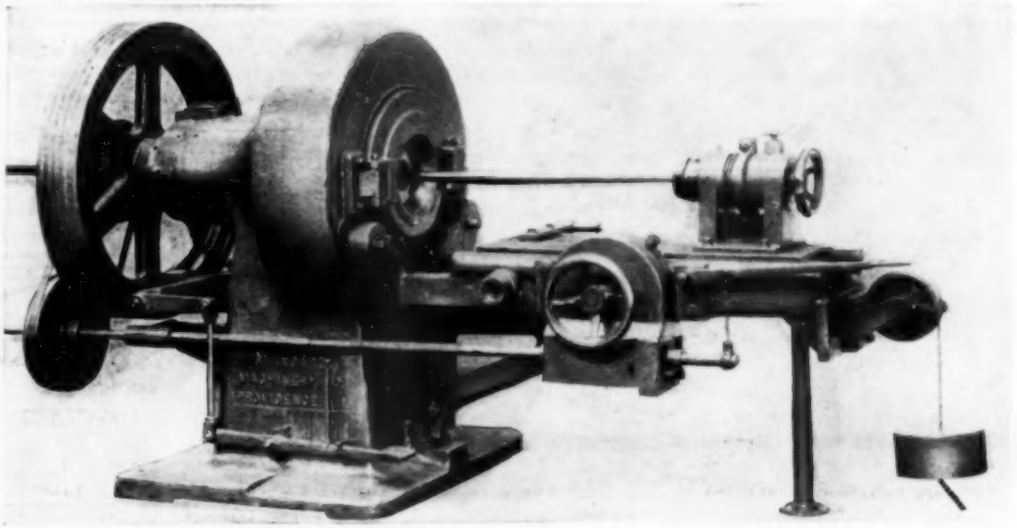
Langelier "D" Swager, which is used interchangeably as a 2-die or 4-die machine on tubing to 1⅛ in. Design features are: Timken spindle bearings; head lubricating system consisting of reservoir, pump, filter and 2 pipe lines to spindle and head rolls; and water jackets to permit hot swaging



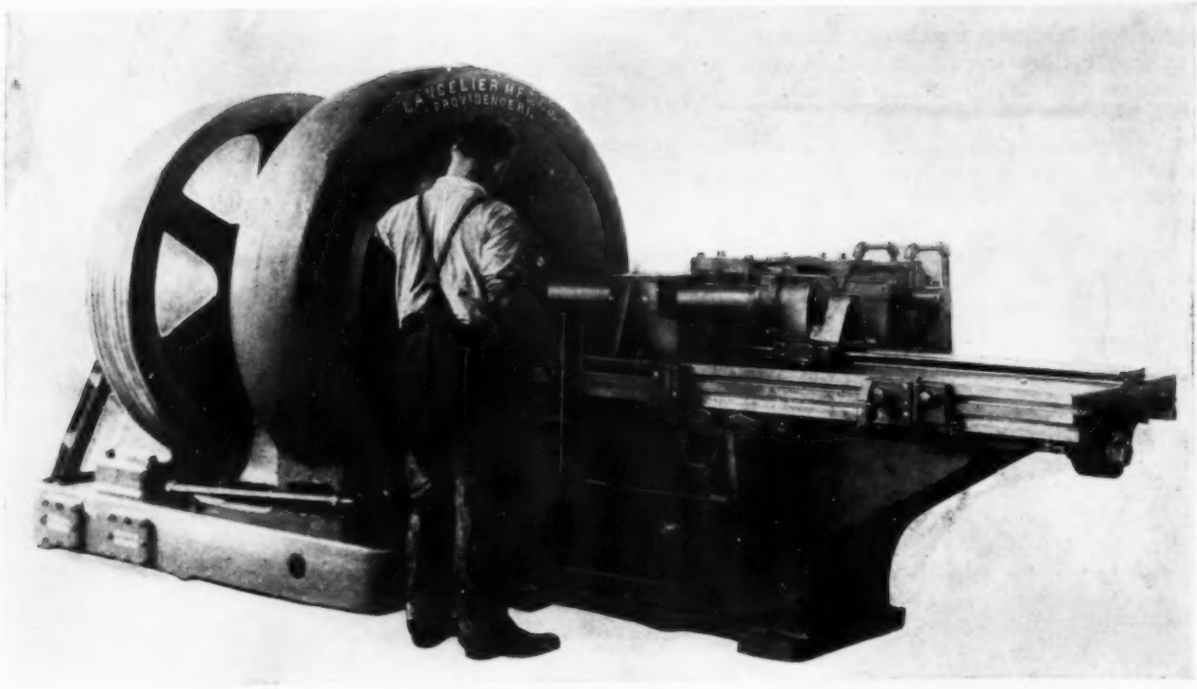
A pneumatic feed applied to a "Standard" machine permits maximum feeding thrust for angles up to 45 deg. between the original and reduced diameters of the work



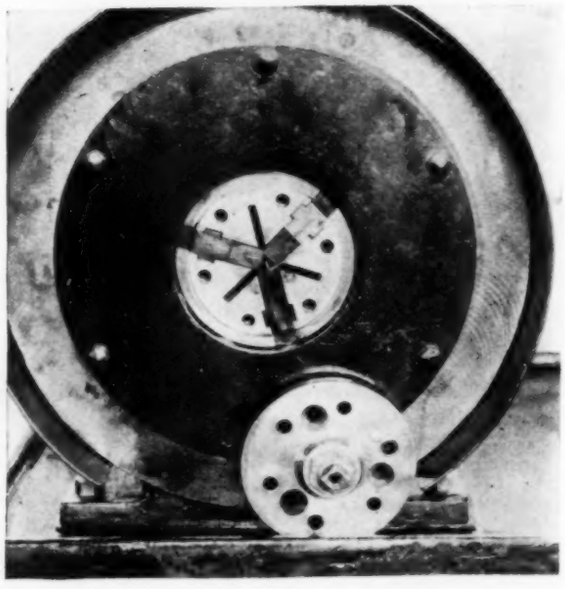
On the scriber point, the saving in material is 51 per cent; savings in labor also result. Often the saving in material will pay for the swaging operation



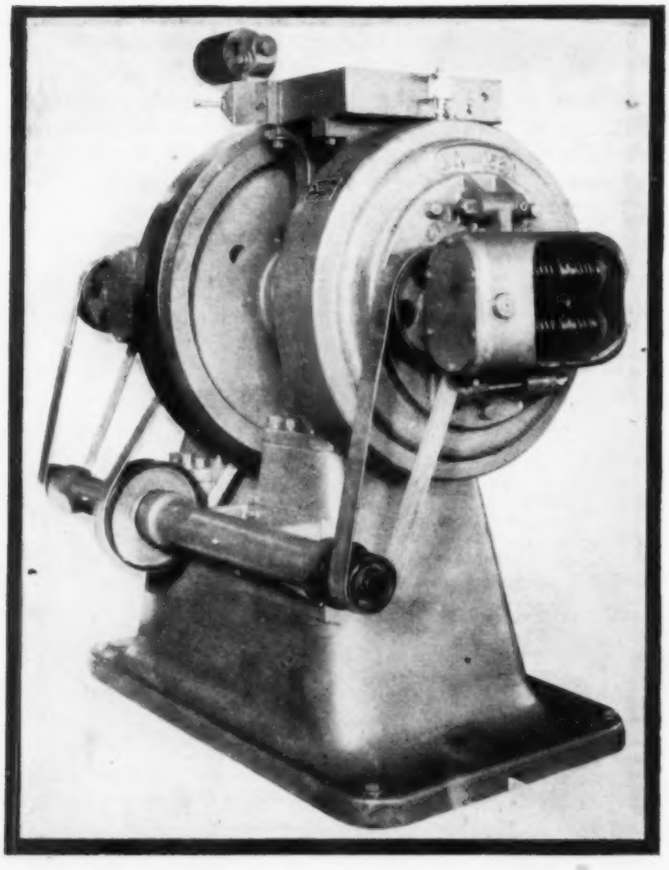
Swaging a long taper on each end of a brass tube is done in successive operations on this "Standard" No. 5½ A machine. The semi-automatic fixture is power driven and feeds to an electrical contact that drops the feed worm out of mesh, permitting the counterweight to return the headstock to the back position



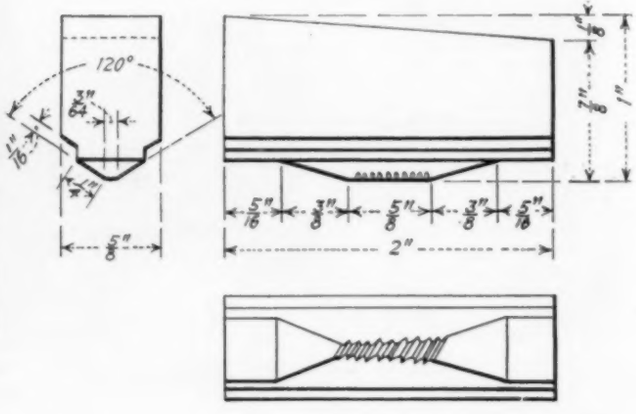
Langelier "L" Swager, the largest size, taking tubing to 6 in. and having a standard 9-in. die length. The feeding mechanism is hydraulically operated, and the work-holding jaws can be hand, pneumatically or hydraulically actuated



Three-die Sleeper & Hartley swager for threading screw wire, and drawings of the dies employed



A roll feed is applied to this Etna rotary swager when material is to be run clear through



point, especially when hot swaging is done. Water jackets are often used to remove heat from the dies and cage, and means for carrying off oil smoke may be required in hot swaging. Oil that passes through the machine collects scale and other foreign matter, and hence it should be passed through a filter before being re-circulated. It is sometimes necessary to clean scale and other accumulations of foreign matter out of the swaging heads with compressed air when work is handled hot, but a large volume of oil will often wash the scale out.

The next article will discuss the technique of swaging solid and tubular stock by the rotary process. Die design and typical parts with their production times will be included.

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Sources of Information

IN THE preparation of this series on the art of swaging a sincere effort has been made to consult every American builder of swaging machinery. The editors desire to express their whole-hearted appreciation for the cooperation extended by the following individuals and companies:

The Etna Machine Co.
N. D. Abbey, President
H. A. Bowerman

Langelier Manufacturing Co.
H. K. Allard, Treasurer
A. F. Ward, Sales Engineer

Sleeper & Hartley, Inc.
G. D. Hartley, General Manager

Standard Machinery Co.
J. H. Connolly, General Manager
T. M. Allen, Engineer

The Torrington Co.
L. J. Ross, Secretary

The Waterbury Farrel Foundry & Machine Co.
Fred R. Daniels

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Heat-Treatment of Chrome-Moly After Welding

WILMER E. STINE
Research Engineer, Lincoln Electric Company

THE HEAT of welding, whether by gas or arc, disturbs the metallurgical structure of chrome-molybdenum steel and reduces the tensile strength by about one half. Research and experiment on this popular airplane metal show that its original physical properties may be restored by heat-treating after welding. As a result, many airplane manufacturers are now installing annealing furnaces large enough to take an entire fuselage.

Chrome-molybdenum steel used for airplanes has approximately the following analysis: C—0.25–0.35, Mn—0.40–0.60, P—0.040 max., S—0.045 max., Cr—0.80–1.10, and Mo—0.15–0.20. Strength specifications vary, that of the U. S. Army requires a minimum tensile strength of 125,000 lb. per sq.in.

Our experiments with and without heat-treatment with various welding techniques show:

Heat-Treated Samples

Electrode	Width, In.	Thickness, In.	Load, Lb.	Tensile Strength, Lb./Sq.In.	Remarks
Parent plate	0.755	0.046	5,300	152,800	.....
Carbon arc (with parent filler)	0.811	0.079	10,500	164,000	Fracture outside weld (weld not ground flush)
Fleetweld (shielded arc process)	0.930	0.080	11,800	158,500	Fracture outside weld (weld not ground flush)
Fleetweld	0.441	0.069	4,300	141,000*	Fracture in weld (weld ground flush)
Washed rod	0.822	0.049	4,400	109,100*	Fracture in weld (weld ground flush)

*Actual strength of weld metal.

Samples Not Heat-Treated

Electrode	Width, In.	Thickness, In.	Load, Lb.	Tensile Strength, Lb./Sq.In.	Remarks
Parent plate	0.754	0.050	3,100	82,200	.....
Fleetweld	0.857	0.082	5,900	83,900	Fracture in heated zone outside weld (weld not ground flush)
Carbon arc (with parent filler)	0.941	0.038	2,400	67,100	Fracture in heated zone outside weld (weld ground flush)
Washed rod	0.973	0.050	2,900	59,600	Fracture in heated zone outside weld (weld not ground flush)
Washed rod	1.009	0.048	3,200	66,100*	Fracture in weld (weld ground flush)

*Actual strength of weld metal.

The heat-treatment used after welding with the arc was:

1. Normalize to 1,650–1,750 deg. F. and cool slowly in furnace below red heat.
2. Heat to 1,550–1,625 deg. F. and quench in light oil.
3. Draw at 950 deg. F.

Other methods of heat-treatment may prove equally or more successful in restoring the steel to its original strength. In this type of welding, the electric arc process, which localizes the heat, affects a smaller area of metal, consequently is in our opinion somewhat the better welding process.

In our tests the carbon arc with filler material of chrome-molybdenum steel gave the best results, but welding technicians declare that this is not as fast or as easy to handle as other methods. On 16-gage and lighter material, however, it seems advisable to use this method. The tests show that Fleetweld, a heavily coated electrode for weldiing in a shielded arc, is adapted for use on metal of 14-gage thickness and over. The washed electrode, a standard general-purpose welding rod, is drawn to the same specifications as "Fleetweld" but does not utilize the heavy extruded coating. Both electrodes had the following analysis: C—0.10–0.18, Mn—0.40–0.55, S—less than 0.035, P—less than 0.035, Si—less than 0.01.

EXECUTIVE

Mourning Becomes Executive

Although executive bonuses are now chiefly noticeable by their absence, we still hear reverberations of the days when they were in especial favor. The gray aftermath of the bonus spree has left a bitter taste in the mouths of many. But perhaps this strong reaction is just as unfair to the merits of the plan as the over-enthusiasm which formerly carried it too far. Does the company official do better work when he shares in earnings in the form of a bonus? Or is it preferable to reward him on the basis of a flat salary and thus relieve him of the worries of a variable income? What do you think?

"I HARDLY expected to find you in," said Bill Holland to his friend Horace Miller, President of the Express Machine Company. "Isn't it about time for your winter sojourn in Florida?"

Miller smiled, but not happily. "Not this year, Bill. The well known depression is still on, you know."

"You high-salaried executives shouldn't mind a little thing like that," said Bill. "You belong to a class that is probably least affected by the current hiatus. A ten or twenty per cent cut is no reason for you to feel poverty stricken. You've still plenty to keep the wolf from the door. In a lot of homes, she's moved inside and had pups."

"And my home's one of them," said Miller. "This company pays very nominal salaries, and they weren't advanced during the gold rush. Instead, the directors adopted a policy of rewarding executives by annual bonuses based on company earnings. My own share was double my salary, and this year there was no bonus. So instead of the ten or twenty per cent, you speak of, my cut is 66⅔ per cent. The ironic justice of it is that I was the chief advocate of the bonus plan back in the years of plenty. But I've learned my lesson —never again."

"You mean that you don't approve of executive bonuses?" asked Bill.

"Exactly that," said Miller. "Pay a man what he's worth on a straight salary basis, and let it go at that."

"You have a premium plan in your shop," said Bill. "If an incentive is good for the men at the machines, why not for the higher-ups? It seems to me they'd put forth a greater effort if company progress directly affected their pocketbooks."

"Many companies worked on that theory, and in some instances, the plan became abused," said Miller. "In one case, the president's bonus amounted to a million and a half, which finally resulted in a shareholders' suit for recovery. My belief is that no man's efforts are worth that much or anywhere near it. We used to accredit certain individuals with almost superhuman powers to build up enormous company profits. But the past year or so has pretty effectually debunked that idea. It's now evident that most of these supermen were simply riding the crest of the wave and are powerless now that the trough has come."

"Aren't you falling into the fallacy of condemning a good system just because it was abused in a few cases?" Bill asked. "I'll agree that bonus plans, like all good things, can be carried to excess. But I still think that there is merit in any scheme that gives an official a direct financial interest in the prosperity of his company."

"All higher executives should be shareholders to show their interest and confidence in the corporation's success," said Miller. "But recently we've witnessed officials selling their own stock short, and others wishing they had. So even stock participation has its shortcomings."

"Then why isn't a moderate bonus plan the sensible solution?" persisted Bill.

"Because a man works better when assured an income free from the fluctuations of the business cycle and the stock market," said Miller. "If he's worthy of his executive job, a steady salary is sufficient to induce his best effort, and no additional incentive is necessary or desirable. Nothing constructive is gained by giving a man a Palm Beach appetite one year and a Coney Island salary the next."

"It sounds as though circumstances had altered your convictions," said Bill.

Suggested by Charles R. Whitehouse, The Holtzer-Cabot Electric Company

FORUM

Discussions Of Former Subjects

Control by Council

The economic council would be an ideal organization—one that would smooth out the cycle-line on the depression chart. Naturally, as with any other new proposition it would meet with opposition on all sides.

The country should be divided into districts, large and small, as the population and industries required. Each district should have its own council, composed of men who know that particular section of the country, its problems, and methods by which production and labor could be controlled.

The whole economic body should be liberally backed up in its policies and mandates by the Federal Government. True, it smacks of bureaucracy, but doesn't any business that is well organized? Don't our mills and factories have their own dictators? Do they suffer from the administration of these potentates? They do not, because the men on the top have been chosen for their level-headedness. PHILIP DEL VECCHIO.

A board appointed to advise or control business with the object of smoothing out the violent ups and downs would be another annoyance. If this council had legislative backing to enforce its mandates, Heaven help business. If it could only advise nobody would listen.

Business has always gone ahead in spite of legislative assistance. In times of prosperity, some businesses will always expand beyond reason; then when business slows up, as after the War, everything looks bad. How any council can control this, with or without legislative power, is beyond me, any more than a law can stop people from gambling as in 1929.

Less governmental assistance or interference will help more than anything. —U. SETH EBERHARDT, *Works Manager, Newark Gear Cutting Machine Company.*

Shifting the Burden

The only way to utilize mechanical improvements is to get work for the machines to do, and this is only done by making one's article cheap enough for everyone to buy. I cannot see how the multiple-shift system is going to improve matters. The men are working the usual hours for the same money. It is not natural for the night workers to turn out as great an amount of work; consequently the article produced may be dearer.

To make articles more cheaply, the men must work longer hours for the same pay. People will buy the cheaper goods, and orders will pour in. Then there will be more work in the shops, and we can take advantage of the mechanical improvements.

—R. H. JACKSON, *Barrow-in-Furness, England.*

The Up Grade

About the time I was in school, leading educators thought school gave general mental training. The study of mathematics was supposed to train the student to reason. Latin and other languages were supposed to give a mental discipline that would be of value in all kinds of life.

About fifteen years ago there was a wave of superficial studies which were supposed to show that the school increased the earnings of its students. Even now we often hear these studies repeated. We hear plain statements of the money value of education based on figures that have since been proved false.

Recently, leading educators have taken a more critical attitude and have tried to find out the facts. They find that the effect of mathematics, in improving reasoning power, is so small that there is doubt about its existence. They have found no discipline in mathematics that could not be secured in a machine shop. The money value of education has almost vanished. Not one careful study has shown that the college added one cent to the average income. Some have appeared to show a gain, but the gains are so small, that the question remains open as to whether there is any.

So educators are coming to the view that the value of the school is mostly in the information given. This information is all contained in books and can be secured by any ambitious person, regardless of school. The biggest factors seem to be native ability and the proper selection of a vocation—one that uses the kind of ability that the individual possesses.

It is true that business men are turning to the college graduate, but that is because so few intelligent ambitious boys fail to go to college. A search for first class minds in industry, who might profit by college training, conducted by the Massachusetts Associated Industries, failed to find a single one. But when two boys start equal in ambition and intelligence, and one goes to college and the other to the shop, I am convinced that the shop-trained boy will advance to higher positions and keep ahead of the college-trained. —A. W. FORBES, *Forbes & Myers.*

The growing demand for specialization, for expert knowledge on the subject of organization, and for a higher technique in production engineering are all overwhelmingly in favor of the technically trained man. It is becoming increasingly difficult for a practical man to grasp the ever changing values that govern the organization of industry. To possess a quality for leadership, good as it is, is now only a minor issue. To achieve a skilled technique in the workings of machines and production methods is after all but a step on the way. For today, when machines outweigh and almost eliminate the human element, where the highly skilled job of yesterday is done with ease and rapidity on a battery of machines with one operator, the value of an assistant superintendent lies not in his ultimate knowledge of such machines and men but in their regulation as a unit to the factory as a whole.

Expert knowledge on such things as materials, design of product, costing, planning, and salesmanship are of far greater value. The need today is not for practical men with a smat-

tering of technical training but for technical men with an essential amount of practical experience gained in the shop. —R. G. HEWITT, *Keighly, England.*

Self-Contained

Theoretically, it should be possible for an independent outsider to set himself up, with a minimum of overhead, collect a mobile force of experts, and contract to handle work within the scope of these experts' capabilities for a group of nearby industrial establishments. In actual practice, however, there must be a considerable and reasonably stable supply of work to enable such an outsider to maintain a reliable crew. Such a crew, except in rare instances, cannot hope to possess the intimate personal knowledge of individual customer's property, that a regular employee of that customer would have.

As a matter of fact, the line of demarcation between the profitable and unprofitable in this connection lies almost wholly along the line which constitutes the boundary between the small and the large shop. The small establishment has only occasional auxiliary jobs of electrical work, piping, toolmaking, and the like, and cannot hope to justify the carrying of specialists in these lines on its payroll. To such an organization, the outside service firm with a fair price policy and record for service would be of inestimable value. Once a plant has developed to a point where the number of electrical machines, the amount of millwright work, pipe fitting, and the like, demand fairly constant attention, it becomes more economical to acquire gradually a maintenance and service crew within the organization.

—D. C. WRIGHT, *Operating Manager, Graver Tank & Manufacturing Corp.*

There is no economic justification for a number of individual set-ups in each industrial community to do work which a specialized few could do satisfactorily. There is no question that money can be saved in many such instances by passing work on to responsible central agencies.

Nor is there any question that in many individual instances a study will indicate just the opposite. The main point is that we should all know where we stand—not forgetting the supervisory time needed (or saved) in our plan.

I recently went through an experience in de-organizing. Work which had been costing us about $8,000 a year and requiring no end of executive supervision was farmed out. We decreased the expense only nominally, but we're getting a better quality of actual work at the hands of specialists, and we're saving ourselves a lot of grief. What's more, we get better attention to our problems and better service than we ever had before—so much so that we wouldn't go back to the old way for anything short of a 25 per cent saving. The reason is that the work is a business to someone else; to us it was an incidental nuisance. —WILL ARMOUR.

Stockholder vs. Employee

One man buys stock in a company. He furnishes some of the money to run the business. Another man accepts employment in the company. He furnishes some of the brains to run the business. Always we need both these men to enable the business to succeed. Generally speaking, the workman, if we consider yearly income, has a greater interest in the firm than does he who buys the stock. Yet for some reason, managers will consider only one of these men in a period of hard times, and that one will be the one who puts in the money.

One of the various reasons why large firms fail is the mistaken idea some managers and presidents have that they are working for the stockholders only. When officials think only of the money side and not of the men, then loyalty from the bottom up ceases as it has already ceased from the top down.

When a certain firm was in difficulty, they hired a man to take charge of the business. The price of stock immediately began to rise and the great reason given was, "The firm will now succeed as this leader always gets along with the men under him." Consideration from the top down raised the price of the stock, and the same consideration will raise production per man, which in most cases means profits—dividends for the stockholder. Why should not the workers be considered equally with the stockholders? Why should money and nothing else be considered? Let us call off all workers from some firm and arrange so that no others take their places. Let the company have all the money that the big bankers can furnish. How long will that plant last? —C. G. WILLIAMS.

Dominant or Dumb?

The day has gone for one-man domination in corporate activities. The loud spoken, desk hammering, domineering, and despotic chief of a business has few counterparts today. This character of man belongs to a past generation or to a provincial enterprise. His mind is as provincial as his surroundings.

No one mind has all the brains. The biggest minds of the largest enterprises are humble, patient to an extreme degree, tolerant of the intelligence and ability of others, contemplative, and deep thinking. They are receptive to suggestions and conferences. They review every viewpoint of a question, after which, they calmly give a decision. This decision may be final or amenable to modification if it involves important issues based on sound and reasonable objections. Their sole motive, under a sense of deep responsibility, is duty to their engagement, loyalty to their associates, be they single individuals or an army of stockholders.

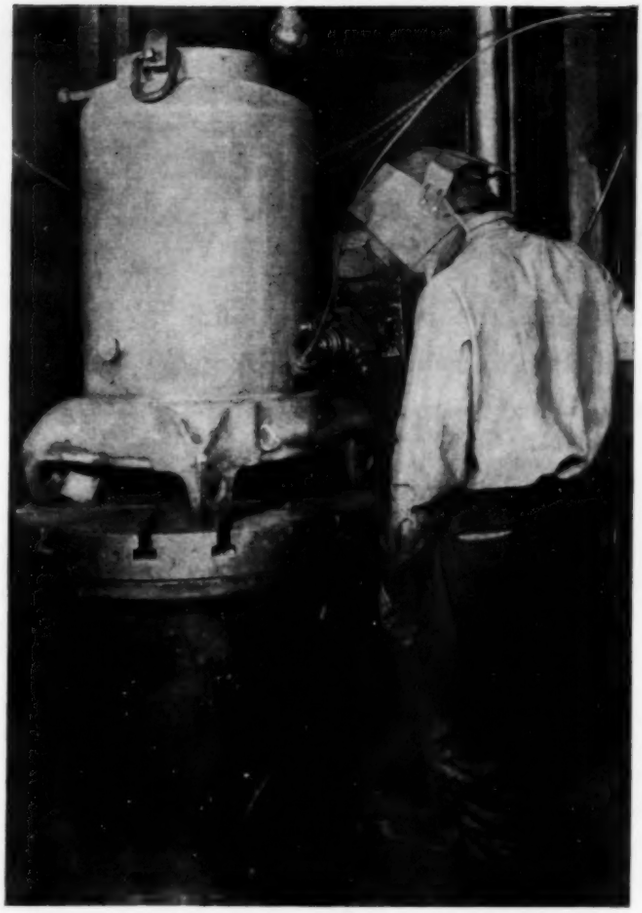
—HOMER A. HERR, *President, Automatic Centrifugal Company.*

Hand to Mouth

The religion of low inventory covers a multitude of managerial sins of omission as well as commission. It is frequently the source of many alibis for failure to meet promises and is the cause of much buck passing. Of course, the inventory should be kept as low as is consistent with costs and sales. But it is really inexcusable for production to be stopped and delivery delayed through a shortage resulting from too low an inventory.

The management of a company should have a fair idea as to probable sales from month to month. Without this as a basis to work on, they are not only fooling themselves but involving others as well. So they should determine their current needs and order large enough quantities far enough in advance so that their supplier can fill them at a profit.

It costs practically the same to buy, sell, bill, deliver, receive, and pay for a piece of steel one foot long as it does for a couple of bars. This applies to everything else used in the plant that is not perishable. Naturally, someone has to pay for the increase in costs caused when many small orders take the place of a few larger ones. —L. O. BROWN.



Welding a cast steel ring to the top rim of a circuit breaker tank. The casting, containing various difficult pockets and brackets, is first machined, then welded on automatically

Castings in Welded Structures

J. G. RITTER

Welding and Foundry Engineer
Westinghouse Electric & Manufacturing Company, Inc.

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WELDING can now be considered as fundamental a process as riveting and casting for making products of metal. Westinghouse uses over 1,000 tons of welded structures a month despite the fact that the company operates five iron foundries and a steel foundry.

Experiences of the last few years have quite definitely established the dividing line between different methods of construction. Relative costs of welded and riveted structures are easy to determine, being largely a comparison of the actual cost of the riveting operation to that of welding. Riveting has been practically eliminated even in departments which had elaborate riveting equipment.

Comparison of cost of a welded structure and a casting is, however, much more complicated, especially when the manufacturer operates a foundry. In general the most important factor is the number of pieces to be made; if only a few pieces, the saving in pattern cost usually insures cheaper welded construction. In high production, pattern cost does not affect the cost comparison so greatly; it is usually about the same as that of the jigs and special tools required for welding. For example, one of our synchronous motors made in quite large numbers, has frame, rotor and bedplate welded, but the bearing pedestal is cast, since investigation has shown that it can be cast more cheaply if more than four are needed. Welded bedplates are most economical regardless of quantity, since relatively little welding and fitting is required for the weight. Another factor often involved when a decision must be made is that of quick delivery. Here welding has the advantage.

In general the welded structure does not have as great an advantage over steel castings as it does over iron castings. This is because cast steel is as strong as the plate used in welding; weights are about the same. For example, a cast steel waterwheel generator rotor 25 ft. in diameter was found to be more economical because the shapes required for welding required too much labor. Rotors as large as this but of more simple design have been constructed by welding. Again, size may enter—we cast one steel mill motor in smaller sizes and weld in larger ones. In a 350-hp. high-speed diesel engine we cast the upper half in one piece, for even if plates, forgings and castings are combined by welding, the design is too intricate for low costs. The bottom piece, or bedplate, is however, made by welding, since the design consists mostly of flat thin walls more cheaply welded.

Often the cost of a welded structure is increased materially because some parts are quite complicated and require a relatively large amount of labor. The logical thing to do is to construct these parts of steel castings, then weld them into place. Cast steel with a carbon content of 0.30 per cent and under can be welded as successfully as rolled steel. Higher carbon and alloy steels can be used with proper welding procedure.

The apparatus that carries the lower guide bearing of a large waterwheel generator is fabricated, but the guide bearing is supported by four steel castings welded to the I-beams in the center of the structure. In making welded steam turbines there are several points where steel castings may be used to advantage. Some parts with cored passages are cast, then welded to the rest of the structure. A locomotive frame that we constructed had brake hanger lugs and other similar small castings welded directly to the structural members that formed the frame. Lifting lugs are used on a variety of apparatus; if made of steel they can be welded in place at a much lower cost than by riveting or bolting. The main frame for a large gyroscope that we made had main trunnion supports of steel castings welded to the main fabricated structure. One underground transformer tank we build up by combining a welded structure with cast iron. Sheet metal is formed and welded to make the side walls, which are then put into molds and the tops and bottoms are cast in place.

Condensed from a paper, "The Use of Castings in Welded Structures," presented at the Annual Meeting of the Steel Founders' Association, Stevens Hotel, Chicago, Jan. 21.

The Invention of the Slide Lathe

JONATHAN T. LINCOLN

Several interesting and hitherto unknown facts concerning the influence of David Wilkinson on early American machine tool development, brought to light through the historical research of the author

IN HIS "English and American Tool Builders," Joseph Wicksham Roe has clearly set forth the contribution of Henry Maudslay (born 1771) in perfecting the slide rest and screw-cutting lathe. Roe is quite right in the statement that too much value cannot be placed on the slide rest, and its combination with the lead screw, operated by change gears, because this combination is used in some form in almost every machine tool; and he is also justified in his statement that this lathe is one of the great inventions of history. His claim, however, that Maudslay's influence was paramount in developing the slide lathe in its modern form, is open to question.

The case for that early American mechanic, David Wilkinson, deserves careful investigation. It is possible that a claim of actual priority can be made for him, or failing this, it is certainly clear that he started, simultaneously with Maudslay, a development in American machine tool building as important as the similar development in England.

Roe himself has noted that, "in 1797 David Wilkinson invented a slide lathe which was patented the next year," and he states, on the authority of a local historian, that Sylvanus Brown, of Pawtucket, is also said to have invented the slide lathe at an earlier time, in 1791, and to have used it for cutting wrought iron screws for sperm oil presses. But he then adds, "There are good records of Maudslay's slide lathes; in fact, screw cutting lathes made by him prior to 1800 are in the South Kensington Museum at London. Priority can hardly be claimed for these American lathes until something more is known of them, and whether they were the equal of Maudslay's in design and quality."

The purpose of this article is to contribute something to a fuller knowledge of Wilkinson's invention and his influence on American machine building. Fortunately for a more complete description of Wilkinson's lathe and the process by which it was evolved, we can turn to his own "Reminiscences," written in 1846. And how his invention was passed on to other American machine builders and was modified in their hands may be inferred from the history of machine tool building in the United States.

Early Methods of Screw Cutting

The events that led Wilkinson to the invention of the slide lathe are interestingly outlined in his *Reminiscences*. About 1786-87, he tells us, his father, Oziel Wilkinson, bought of Israel Wilkinson of Smithfield, R. I., the machinery which Israel's father had used in cutting screws for pressing paper. Israel Wilkinson's father had built the Hope Furnace in Scituate, R. I., for the Browns and others, and with a Mr. Crabb, also employed by the Browns (John, Joseph, Nicholas, and Moses), had built the sperm candle works in Providence. In this plant was used a screw of cast iron about seven inches in diameter and between five and six feet long, which "was cut by setting it upright, with a wooden screw guide which was connected with an iron socket, with a mortice to hold the cutter, which was fastened with an iron wedge."

After the elder Israel Wilkinson had finished the candle works, he set up for himself a shop in Smithfield for making screws, which he "cut in the same manner as the English plan brought over by Mr. Crabb." Oziel Wilkinson, who had learned the art from Israel, taught David to mold screws. David was then a boy of fifteen. These screws weighed nearly five hundred pounds, were five inches in diameter with lantern heads in which were cross holes for a lever seven inches in diameter. David not only molded the screws at the Hope Furnace but finished them in his father's shop in Pawtucket.

The First Machine

"There," he says, "we made many screws of wrought iron for clothier's presses and oil mills, but they were imperfect, and I told my father I wanted to make a machine to cut screws on centers. He told me I might commence one. . . . About 1794, my father built a rolling and slitting mill at Pawtucket, on the gudgeon of the wheel of which I put my new screw machine in operation, which was on the principle of the gage or sliding lathe now in every workshop almost throughout the world; the perfection of which consists in that most faithful agent *gravity*, making the joint and that almighty perfect number *three* which is harmony itself. I had never seen my grandmother putting a chip under a three-legged milking stool; but she always had to put a chip under a four-legged table to keep it steady. I cut screws of all dimensions by this machine and did it perfectly."

Wilkinson then made a model of his machine with the thought of applying for a patent. But before doing so he visited New York and Philadelphia to make inquiries as to whether others were using a similar method. In New York, he found an Englishman named Barton making clothier's screws by welding an iron guide on the end of a tap and forcing it by hand through a socket, with an iron bar; in Canaan, Connecticut, he found the

firm of Forbes and Alen making screws by power, but they too welded on and forced through a socket in the old way; and in Philadelphia, he found that all screws were made by this method. In 1797 he again went to Philadelphia, while Congress was in session, and made application for the patent which was granted in the following year.

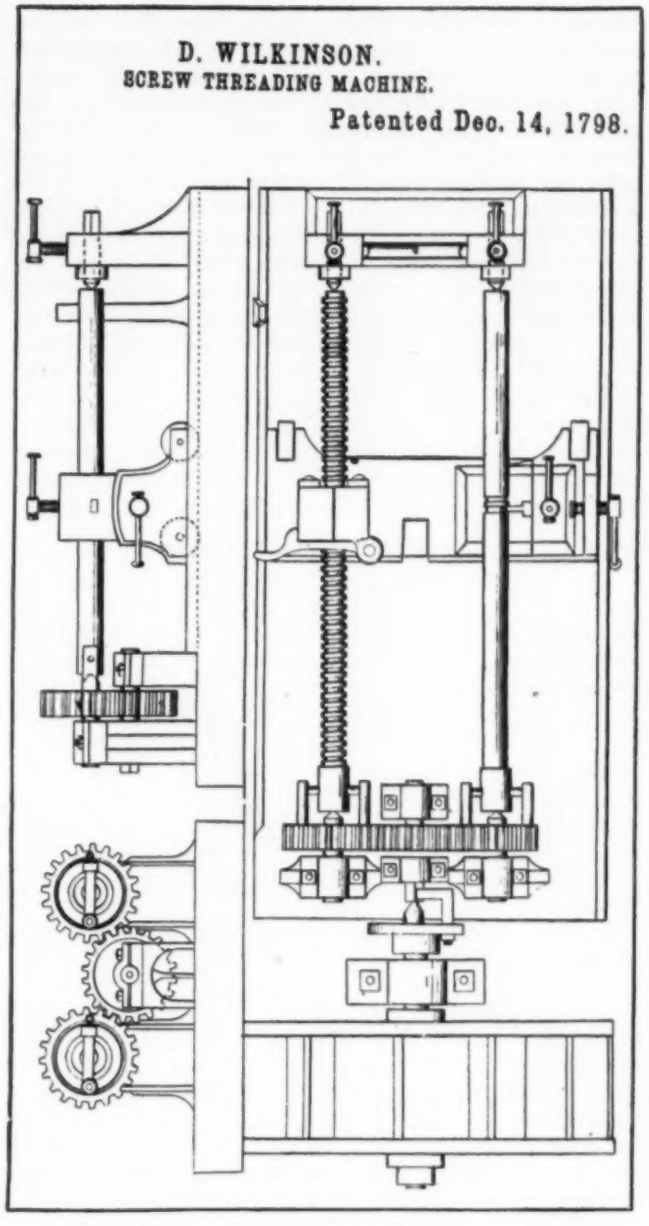
The association of David Wilkinson with Samuel Slater is well known and is stated simply in the *Reminiscences:* "Mr. Slater came out with Moses Brown to my father's at Pawtucket, to commence an Arkwright frame, and breaker, and two finishers, carding machines. I forged the iron work and turned the rollers and spindles, in part. All the turning was done with hand tools, and by hand power, with crank wheels." He continued to work on machinery for Slater and proposed to make a slide lathe on the principle of his screw machine which had been made for heavy turning and was too heavy for turning spindles and spinning rolls. Slater refused this request saying that he had heard of a lathe built in England, since he came to America, a lathe which would turn rollers. He wrote to his brother John Slater to come to Pawtucket and bring with him a man who could build such a lathe. John Slater came bringing with him John Blackburn who "made a slide lathe which was on the principle of the old fluting machine, with the slide rests grooved in, and four edges, on two edged bars, forced towards each other in mortices, behind the tenon."

An Inventor's Reward

This lathe was not successful, being used for a few weeks and then discarded, Slater and his mechanics returning to the old hand tools as before. But in 1806, Wilkinson's father, his brother, and others purchased a water power at Pomfret in Connecticut and commenced building a factory there. These owners consented to the building of a slide lathe on the principle of Wilkinson's screw machine. The *Reminiscences* state that Wilkinson completed his lathe, leaving out the three friction rollers that ran under the rut of the larger machine and that it worked perfectly. "Mr. William Anthony," Wilkinson adds, "who was building a factory at Coventry, with his brother, paid me ten dollars for the use of my patterns to cast after. And this is all I ever received for so valuable an invention." The significance of this statement will appear later.

An additional excerpt from the *Reminiscences* will throw more light on the construction of Wilkinson's lathe. "Captain Benjamin Wolcott, father of the Wolcotts at York Mills, Oneida County, New York, put the 'live centre' arbour and rack in place of the screw for the feeder, to a lathe they built afterwards. But on long experience the screw is found to be the best, and the two 'dead centres' will make the truest work,—though they are not so convenient, perhaps as the 'live centre' arbour. But the two great principles of my machine can never be improved upon—that is, *three bearings* to the rest and *weight* to hold it down."

Wilkinson built lathes for his own use, and his invention was copied by other American mechanics; but because of his other interests, it does not seem that he made profits from his invention. Fifty years after his patent was granted, in 1848, Wilkinson petitioned Congress for relief and was granted the sum of $10,000. When the bill entitled, "An act for the relief of David Wilkinson" (Senate Bill 187, 1st Session 30th Congress), was introduced in the Senate it was referred to the



This drawing, included in Wilkinson's original patent, was overlooked by previous investigators. It forms an important link in the chain of evidence that gives Wilkinson a claim at least equal to that of Maudslay in the invention of the slide lathe

Committee on Military Affairs and their report was ordered printed.

This report throws additional light on Wilkinson's claim to the invention of the slide lathe. It begins as follows; "It appears that David Wilkinson, the petitioner, obtained in the year 1798, letters patent for the discovery of a machine for cutting iron, etc., called the 'gauge or slide lathe.'" And it goes on to recite that the inventor of this valuable improvement, during the fourteen years, to which the duration of his patent right was limited, was occupied, for the most part, in the manufacture of cannon for the navy, and the perfecting of the iron power looms which had contributed greatly to the national prosperity; that, owing to these circumstances and ignorant of the requirement of the law, the petitioner omitted, in 1812 when his original patent expired, to apply for a

renewal of the right which would have been, without doubt, granted; that being thus left open to general use, an invention so important could not fail to be sought after, not only by the public, but by the agents of the government engaged in making arms of various descriptions, and as a fact, "we find that the gauge and sliding lathe was early introduced and made use of in all the arsenals and armories of the United States;" that the great utility of the machine in making firearms is found in the numerous communications from officers of the ordnance department and others high in command which accompany the petition; that the failure of the petitioner to secure a renewal of his patent right, however injurious to himself, was eminently beneficial to the world at large and to the government of the United States which has at present in use nearly two hundred of these lathes in public workshops, constructed at a cost much less than the sum which would have been paid the original patentee had he maintained his exclusive privilege.

The Congressional Report

The report, moreover, finds the petitioner to be "the true and undisputed author of the invention;" and the committee is of the opinion "that to David Wilkinson, as the inventor of the gauge and sliding lathe, the government as well as the country at large owes a debt of gratitude not to be easily estimated, and the least the government can do is to manifest, however inadequately, by pecuniary compensation, the sense entertained of the obligation under which the nation is placed." The Committee thus reporting the bill favorably, it was passed by the Senate, June 30, 1848. The bill was sponsored in the House by John Quincy Adams and was passed August 12.

David Wilkinson made three important contributions to the development of American industrial life: the perfecting of the power loom, bringing it, except for the automatic filling attachments and the warp-stop motion, to practically the same form it has today; the invention of the slide lathe; and the training, in his workshop, of many of the pioneer machinists who later were to exert an important influence in the growth of machine building in America. Wilkinson's influence in training many of the foremost early American machinists has a bearing upon the extension of the use of machine tools in the United States and specifically on the manner in which his slide lathe came early into common use in the workshops in New England and elsewhere.

Acquiring his first knowledge of textile machinery by assisting Slater to set up the first successful American cotton factory, Wilkinson himself, in 1810, established one of the first important independent machine shops in the United States. To this shop were attracted a number of ingenious young mechanics at a time when the name machinist was all but unknown in this country. Many of these men afterwards established important machine companies. In Wilkinson's shop, they worked on lathes which he had constructed. It is highly probable that, when they set up for themselves, they built machine tools on the principle of Wilkinson's invention.

One of the graduates of Wilkinson's shop was Edward Bancroft, who in 1848, with William Sellers, formed in Philadelphia the firm of Bancroft and Sellers, which became known, after Bancroft's death in 1855, as William Sellers & Co. Machine tools made by Bancroft & Sellers were widely sold in this country and in Europe. Most of the early textile machine shops established between 1810 and 1850 made machine tools for their own use and often for the general market. As has been pointed out, many of the founders of these companies, like Bancroft, had acquired their skill in machine building while working in association with Wilkinson.

There is at present no evidence that Wilkinson made machine tools extensively for the market, as did Maudslay, in his own shop, but there is clear evidence that he passed his invention on through other machinists.

A single instance of this process is characteristic of many others. James S. Brown, who as a boy, worked in Wilkinson's shop, became one of the early builders of machine tools. In 1820, he invented an improvement on the slide rest, by which the height of the tool could be adjusted while the lathe was in motion; and Brown continued to contribute to the development of machine tool building in the United States until well into the second half of the last century.

It is possible, moreover, that Wilkinson's invention was copied in England as well as in the United States. We have it on his own authority that at least one of his lathes was sent to England—and there may have been others. This is a question well worth investigation. In the present state of our knowledge concerning his influence on machine tool building, it is highly imaginative to suggest that some of his ideas may have been passed on even to Maudslay himself, through the Frenchman Brunel. Nevertheless, the suggestion arises from the same form of scientific imagination that discovers planets before they are visible in a telescope and reconstructs some prehistoric monster from a few fossil bones.

Brunel's Part

Marc Isambard Brunel, it will be remembered, was a French naval officer, who because of his loyalty to Louis XVI, found it necessary to escape from Paris in 1793. He took ship to America and remained in this country for rather more than five years. During this time, he became naturalized, was appointed chief engineer of the city of New York, built a cannon foundry there, submitted one of the competitive designs for the Capitol at Washington, and assisted in planning the fortifications of the narrows in New York harbor. It was in America that the idea of the Portsmouth block machinery came to him. Brunel left America in 1799 and spent the remainder of his life in England.

Roe has described Brunel's close association with Maudslay in building the block machinery. An interesting speculation, and one well worth careful investigation, arises as to how familiar Brunel became with Wilkinson's screw cutting machine, and the extent to which he passed such knowledge on to Maudslay. Both Wilkinson and Brunel were employed in making cannon for the government of the United States; Wilkinson was certainly in New York and Philadelphia on at least two occasions during Brunel's residence in America; his machines were early in use in government workshops, and in the same year that his patent was granted in Philadelphia, a patent was also granted to Brunel for "a machine for raising water." Because of the similarity of their interests, it would seem probable that Brunel had some knowledge of Wilkinson's machine. All this is now in the field of speculation, but it is hoped that the search for manuscript material on the life of Wilkinson, now being made by the writer, may disclose more definite evidence concerning this interesting possibility.

The accompanying drawing from the patent office

records which, strangely enough, has escaped the attention of previous writers on the subject of the origin of the slide lathe, clearly illustrates Wilkinson's important contribution to machine building. A tool of this description was in operation in 1794, the earliest date thus far claimed for Maudslay's lathe. A comparison of this drawing with the illustration of Maudslay's screw-cutting lathe of about 1797, which may be found facing page 42 of Roe's valuable volume, will establish Wilkinson's claim to at least equal honor with Maudslay in the early application of the principles of the slide lathe.

NEW BOOKS

MARKETING PRINCIPLES—*By John Freeman Pyle, Professor of Marketing and Economics, Marquette University. 565 pages, 5¾x9 inches. Clothboard binding. Indexed. Published by McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. Price $4.00*

During these days, when cherished institutions are subjected to critical scrutiny, our methods of distribution, particularly those phases classed as marketing, have not escaped attack. If one accepted all adverse comments on the subject, he would soon conclude that marketing organizations and policies were hopelessly inefficient.

While it is undoubtedly true that our processes of buying and selling have their weaknesses, much of the criticism directed against them has been made without a clear understanding of the exceedingly complex problems involved. An oft repeated statement is that it costs too much to get goods from the producer to the consumer, that the eddy currents of advertising, brokers, commission agents, and professional traders build up a burden quite out of proportion to the services rendered.

But as the author points out, we must not lose sight of the tremendous task we demand of present-day marketing. We want oriental rugs, fruits out of season, goods up to the minute in fashion, and we insist on being able to buy them at once and at the next corner store. Such service naturally comes high, and perhaps, is not strictly essential in all instances. However, our marketing facilities have evolved to meet these exacting cravings of ours. A sweeping condemnation of the entire structure reaches beyond the bounds of marketing alone and involves the justification for our complicated civilization with its crowded cities and interdependence of widely separated groups of people.

Dr. Pyle presents a scientific approach to marketing by giving the reader a clearer understanding of the subject and a method of analysis. He emphasizes the viewpoint that marketing is an essential organizing force which coordinates the efforts of many.

The functions of buying and selling are outlined together with market characteristics. Marketing practices, as related to a number of widely differing products and services, are discussed and exemplified by specific cases. Problems of financing, pricing, hedging, promotion, cooperation, and the legal aspects are analyzed. The need of executive control through the formulation of plans and policies based on market research is shown.

In short, Dr. Pyle has produced an informative, comprehensive addition to a beclouded subject. Many executives and students of marketing should find in this volume expert assistance in crystallizing and attacking their individual problems.

PRACTICAL MATHEMATICS FOR HOME STUDY, (Second Edition)—*By Claude I. Palmer, late professor of mathematics and dean of students, Armour Institute of Technology. 606 pages, 4¾x7½ in. Flexible clothboard covers. Indexed. 347 illustrations and eleven tables. Published by the McGraw-Hill Book Company, Inc., 330 West 42nd St., New York, N. Y. Price $4.00*

Most of us, when suddenly confronted with a difficult mathematical problem, have realized with dismay that all our training in mathematics has gone, we know not whither. This little book has been planned to meet that need; it is not a schoolbook or a treatise, but a handbook written by a man who knows thoroughly what practical mathematical problems arise most often. For many years he taught a course of practical mathematics for shop and business men, all of whom were invited to bring to him their problems. These, coupled with problems taken from current literature and the author's personal experience, comprise the more than 3,000 examples and types in the book. The author's first work on this subject was bound in four volumes; this includes all that information and some additional, yet is in good-sized type and is easily readable. Examples in all engineering fields and in all branches of mathematics from simple arithmetic to trigonometry and logarithms are included, supplemented with the necessary tables and explanations. The volume should find a place in the library of the man who finds it necessary to apply elementary mathematics and to brush up on the subject occasionally.

INDUSTRIAL ELECTROCHEMISTRY—*By C. L. Mantell, Ph.D., Pratt Institute, Consulting Chemical Engineer. 528 pages, 6x9 in. Clothboard covers. Indexed. Appendixed. 178 illustrations and 51 tables. Published by the McGraw-Hill Book Company, Inc., 330 West 42nd St., New York, N. Y. Price $5.00.*

Electrochemistry, long relegated to obscurity as just a subdivision of physical chemistry, recently has been achieving ever-increasing importance throughout industry. This book, as its publisher states, "points out and emphasizes the technological importance of electrochemical processes and treats them from the engineering viewpoint. It covers the theoretical and technical sides of electrochemistry, the aqueous and fused electrolyte industries, electrothermics and the electrochemistry of gases." One of the McGraw-Hill Chemical Engineering Series, this volume is well written and authoritatively edited by experts in their respective subdivisions of the field.

Until his persual of this volume this reviewer had no conception of the breadth of the field, sharing the usual opinion that electrochemistry had principally to do with plating, electrolysis, and wet batteries. But this author adds convincingly such diverse subjects as electronics, production of aluminum, graphite and synthetic abrasives, and the electric furnace. If for nothing else than the new concept it gives of the relation of electrochemistry to the modern scheme of things, this book is worth the money.

A Large Compound Die for Refrigerator Legs

C. W. HINMAN
Chief Tool Designer, Kobey Tool Company

Even on heavy material there are sometimes advantages to be gained by the use of compound punches and dies, especially where the production is large enough to justify the cost

Refrigerator leg, blanked from $\frac{3}{32}$-in. steel by a compound punch and die

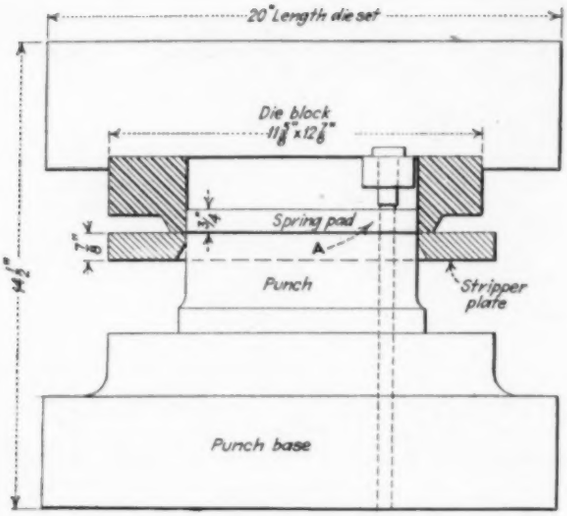


Fig. 1—Elevation of compound punch and die for heavy metal, with die on the punch holder

WITH the large output of electric refrigerators, and four legs to each refrigerator, it is obvious that we could afford to devote considerable study to methods of producing them cheaply. Specifications called for the use of $\frac{3}{32}$-in. cold-rolled steel. A blank was developed from the manufacturer's blueprint, and the problem of dies had next to be solved.

It occurred to us to investigate the possibility of using a compound die for the first operation. Usually a compound punch and die is thought of only in connection with relatively thin material on which the dimensions are particular and burr must be avoided. But there seemed to be several good reasons for making a compound die in this case, even for such heavy material.

On small parts the production is curtailed because of the necessity of waiting for the punching to come back up—or down, depending on whether we place the die on the punch or the bolster. This retardation of output is not noticeable where such a large and heavy piece is concerned.

Another reason for the compound die was the desire to avoid doubling the length of a large tool. Such a die would also make it easier for the operator to handle the material, which at best is heavy and unwieldy. But, most important of all, we avoided a special bolster plate, weakened by a large hole. Instead, we have a solid mass capable of withstanding the impact of the ram without deflecting. Thus, from every practical point of view the compound type of die seemed preferable in this particular case.

The four slugs from the $\frac{1}{4}\frac{5}{2}$-in. perforated holes are easily disposed of by pushing them through the punch and die shoe, as shown in one of the drawings.

In this design of tool, the blank, of course, will stick in the die; but upon the ascent of the ram, the blank is ejected either by the spring pad *A*, Fig. 1, or if upon trial this should fail, and it frequently does fail, we may have recourse to a positive knock-out rod behind the pad, operated by contacting a bar in the head of the press.

On the plan view of the punch and die shoe are shown the perforators *B*. These are commercial, removable punches. Customers calling for large dies for large pro-

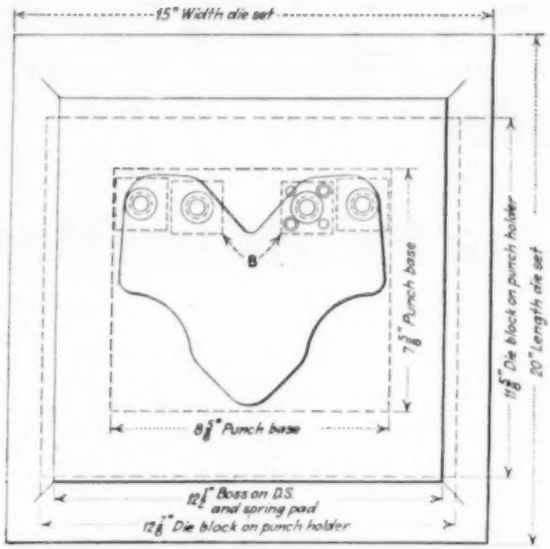

15" Width die set
B
7⅞" Punch base
8⅜" Punch base
11⅞" Die block on punch holder
20" Length die set
12½" Boss on D.S. and spring pad
12⅞" Die block on punch holder

Fig. 2—Plan of the die with removable perforating die inserts. This is an exceptional size for a compound die

duction are specifying removable punches and dies for perforating more often now, since these can be readily purchased and installed in the tool. Broken or worn out members can be quickly removed, and new parts substituted without the necessity of removing a very heavy tool from the press. This idea is a rather late development in tool making and die design. In *American Machinist*, Vol. 74, page 439, will be found the author's solution for removable punches and dies, which seems to me to be more simple and practical than any of the commercial devices for this purpose now on the market.

The second-operation tool is a forming and drawing punch and die and is shown in Fig. 3. Here we indent a "nose" central on the center line of the blank, and at the same time "throw up" two perforated lugs that have the four $\frac{1}{32}$-in. mounting holes for attaching the leg to its cabinet. The indentation is the start of the "foot" at the bottom of the leg; it is made further use of in a subsequent operation. The blank is located "centrally" over the spring pad die by a nest. Detail *C* in the punch holder is the blank holder and forming punch for the lugs, while *D* is the positive indenting punch. When the ram of the press has reached the bottom of the stroke,

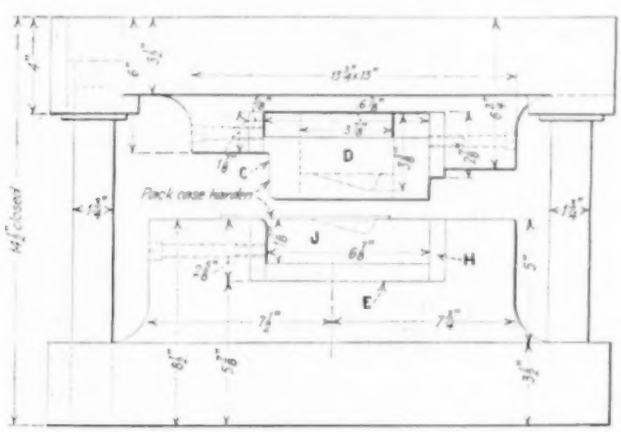


Fig. 3—Punch and die for first drawing operation. The nose at the extreme point is formed at this operation

the die block is stopped against surface *E* in the die shoe, while the lugs have already been formed by its descent, between parts *H* and *C*. The indented nose is "spanked" between parts *J* and *D*.

In the third-operation tool the leg is completed except for the extreme bottom of its foot. This tool is practically the old type V-block forming punch and die, with the desired contour of the inside and outside of the finished leg worked in. The partially formed and drawn

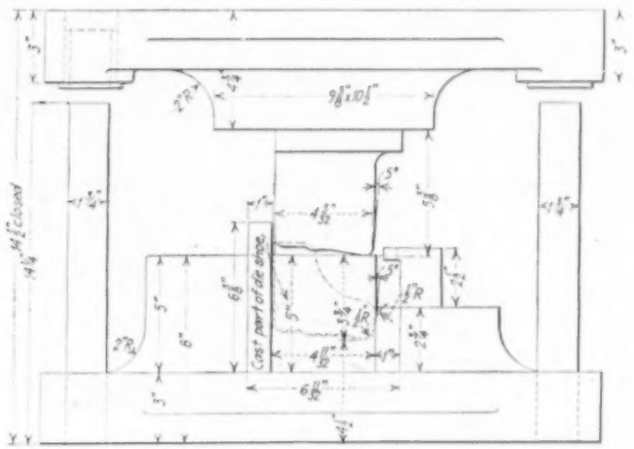


Fig. 4—Second drawing operation. Chrome nickel cast iron is used for the forming punch and die

blank is symmetrically located over the die by the nest. When the punch descends, its extreme lower point first enters the partly indented nose and carries the blank down into the die, folding its outer wings together to within 90 deg. but leaving the $\frac{1}{2}$-radius tip at the foot to be finished in the last operation. This tip could not be practically brought into its proper position in this operation, because it will be observed that the finished part hooks inward at the foot, beyond the parallel sides of the forming punch. Since this tool is of the V-block type and has a 90-deg. opening at the top, the work can easily be removed after forming.

In the final operation the work is placed in the V-block die and over the horn punch located on the die shoe. The uncompleted bottom of the foot is here formed and spanked to shape when the die descends to its fully adjusted depth. The finished leg can be taken off by hand after the punch is clear.

The last two operations might have been combined in one. A sliding horizontal forming block (actuated by a heavy side cam) might have been used for closing in the $\frac{1}{2}$-radius top on the foot. But the "spanking" feature so much needed at this point would have been absent. We thought it better not to take any chances, and more practical to add this fourth operation.

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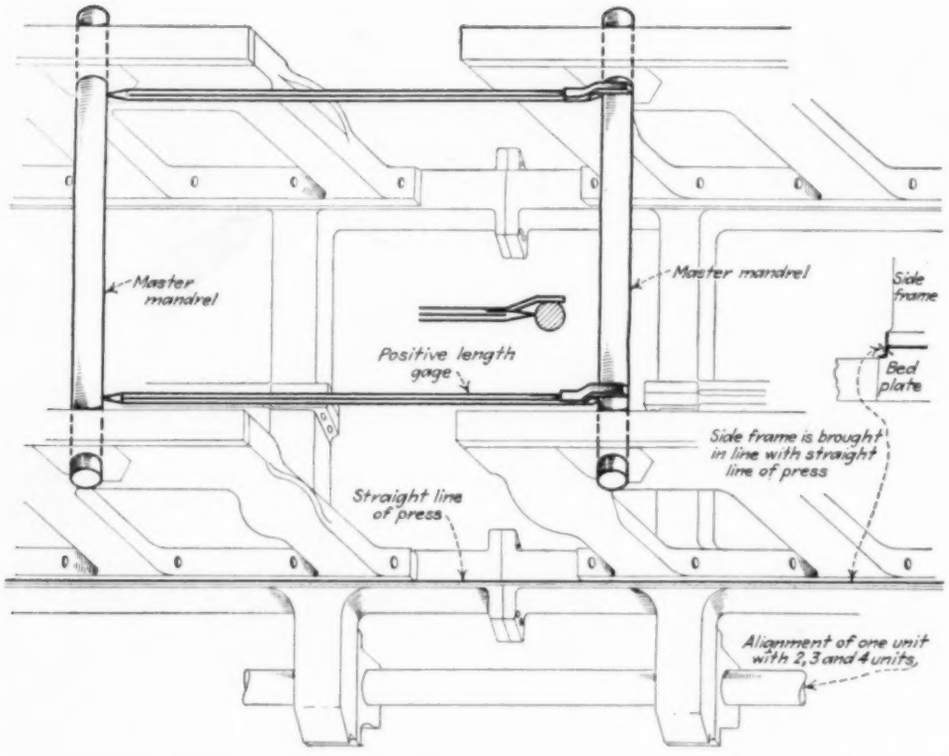
"How does the automobile builder do it? How can he manufacture all his styles and sizes and color combinations economically?"

Read one answer in next week's issue

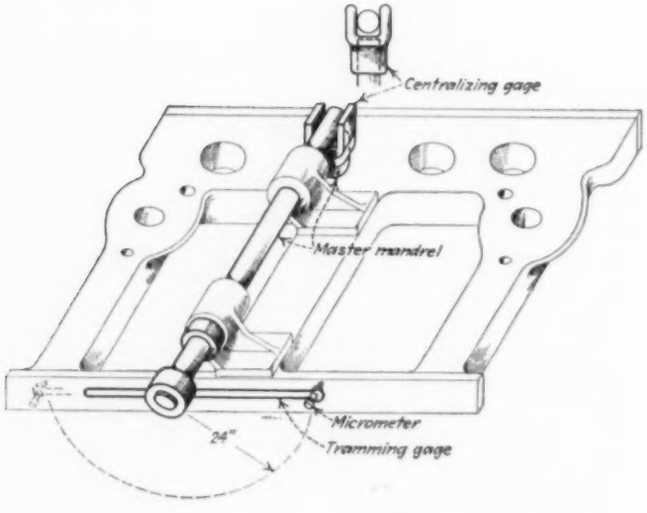
•

Inspection Methods for Printing Press

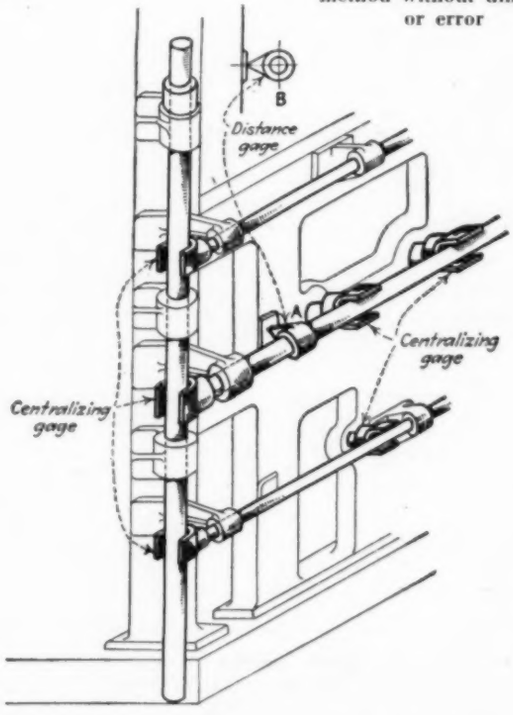

Master mandrel
Master mandrel
Side frame
Positive length gage
Bed plate
Side frame is brought in line with straight line of press
Straight line of press
Alignment of one unit with 2, 3 and 4 units

Units of a large press are aligned from a planed strip on the bedplates. Spacing is checked by measuring the distance between two master mandrels with a positive length gage. The mandrels are supported in cylinder bearing holes

Seven shafts, six horizontal and one vertical, are included in this folder assembly. All are connected by bevel gears. Forked gages at the ends of the shafts or mandrels span the mating shafts to secure correct alignment. An additional gage checks the distance from a planed pad as shown at *A* and *B*. With such sketches as these any good mechanic can follow the inspection method without difficulty or error



To check the squareness of shaft bearings with the face of the side frame a tram is employed. The tramming arm is fastened to the end of a master mandrel and indicates squareness at points nearly 48 in. apart. At the other end of the mandrel is a forked centralizing gage to insure proper positioning of shafts that are to carry bevel gears



Assembly

Perspective drawings and standard instruction sheets define the inspector's duties. Some of the devices used by R. Hoe & Co., Inc., are illustrated

Instruction sheets give inspection operations and allowable tolerances. Items which may be passed by the foreman and those which require the O.K. of the chief inspector are indicated. This makes inspection definite and fixes responsibility

STANDARDS TO BE FOLLOWED IN FOLDER ASSEMBLY. — R. HOE & CO., Inc.

All operations noted for foreman's inspection only, subject to chief inspector's check, to insure maintaining of standards. — examined

FOLDERS

Item			Within	Inspection By Foreman	Final Inspection
1	Check platen for level.....	level	0	F	
2	Check frames with sweep and straight edges for perpendicular and parallelism between frames.....		.005 in 48"	F	C.I.
3	Cylinder bearings reamed and scraped to mandrels.....			F	
4	Setting of ring gears to gage.....		.002	F	C.I.
5	Check horizontal shafts parallel with frames and central with cylinders.....		.0015	F	
6	End play between driving mitre and hub of folding cylinders.....	(Min.	.0055		
		(Max.	.005	F	
7	End play between driving gear and hub of cutting cylinder.....	(Min.	.0055		
		(Max.	.005	F	

Neatness and Economy in a Small Foundry

Discussion

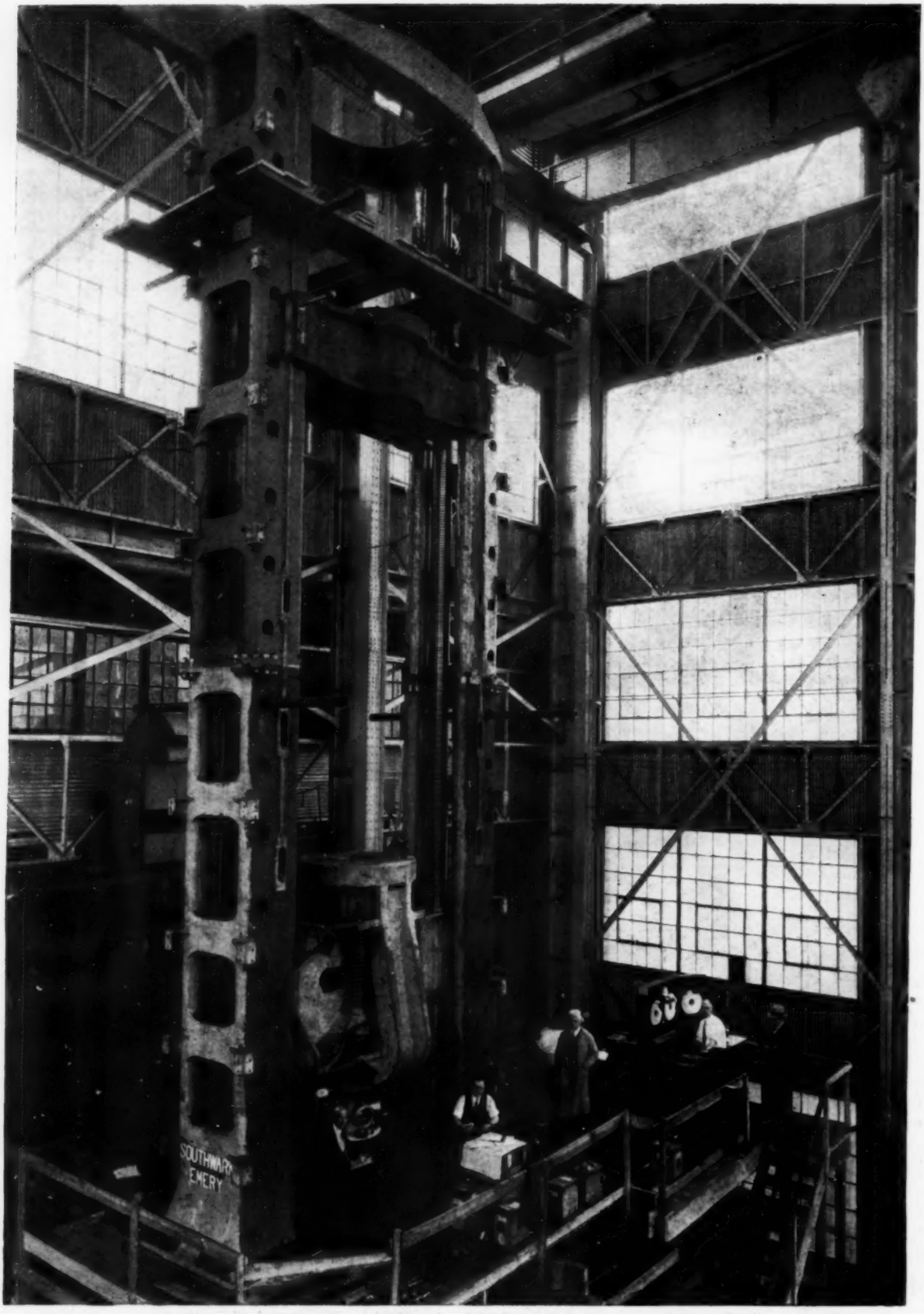
W. R. NEEDHAM
Stafford, England

C A. HARDY'S article (*AM*—Vol. 75, page 550) is most instructive and interesting. For one thing, there seems to be a general idea that in order to obtain examples of efficiency and economy one almost of necessity has to go to the large manufacturers. That this, however, does not necessarily follow is evident from some of the concrete illustrations so convincingly provided by Mr. Hardy in the case of the layout of the new foundry of the Canadian National Railways at Point St. Charles, Quebec.

Once a foundry layout is fixed, however, much depends upon the qualifications, resourcefulness, and particularly the personality of the foundry executive, whether his official title be that of foreman or manager. How he manages his department more than anything else determines the orderliness and the efficiency of the service. Particularly if he is allowed a large amount of initiative and freedom can he impress his own personality upon his shop. But even if a parsimonious policy be imposed upon him from above, and even if equipment and methods be obsolete, the manager himself can do much to mitigate conditions.

On the other hand, of course, it is more than probable that the right caliber man will not be found in such an organization. In most instances, the really keen man would either secure sanction for modernizing the equipment and methods or else transfer his services to a more progressive competitor.

One of the ablest foundry chiefs that I have been privileged to know was in charge of small foundries in North Britain. He was not only an authority on the practical side, but was well educated and took a keen interest in engineering generally, was versed in the metallurgical aspects of his work, and was an accomplished all-round man. His conduct of affairs was altogether admirable. The orderliness and economy of his foundry work was such as those knowing the character of the management and the foundry chief would expect. All of which brings us back to the point that both equipment and personnel count in shop management.



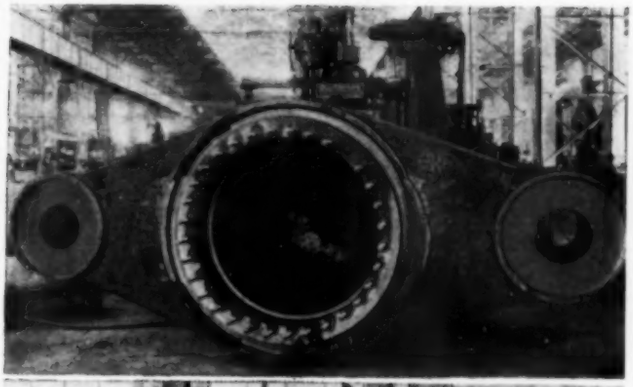
Calibrating indicating instruments with Morehouse proving rings

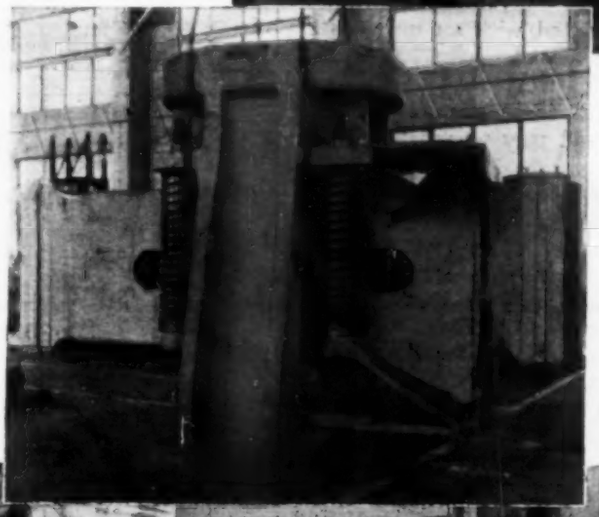
Mr. Emery is at the controls; Prof. Beggs of Princeton University, who is acting as inspector for Prof. Davis of the University of California, stands between him and the machine

Photographs courtesy Baldwin-Southwark Corp.

A 4,000,000-lb. Testing Machine

Southwark-Emery machine just shipped to University of California is largest ever built —Tests columns up to 33½ ft. long—capacity: 3,000,000 lb. tension; 4,000,000 lb. compression; column spread, 10 ft.; length of table, 12 ft.



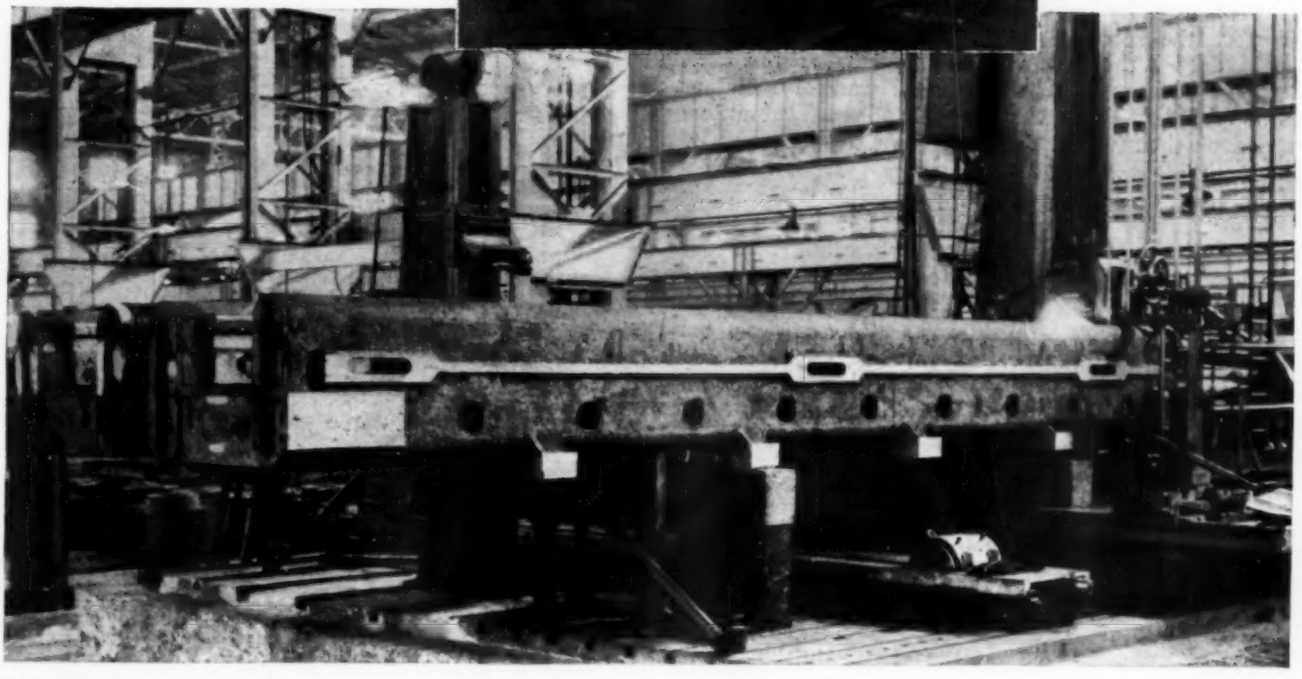


Looking into the main cylinder, a 40,000 lb. steel casting, 46 in. in diameter, which develops 2,500 lb. per sq.in. hydraulic pressure

Machining a pair of column sections. When the machine is installed an elevator will be mounted on the outside of the column to facilitate reading of extensometers

Side view of yoke showing recoil springs, and at *A*, the Emery hydraulic capsule which is the heart of the weighing system

Downward view of yoke and lower crosshead showing recess for tension grips



IDEAS FROM PRACTICAL MEN

A Boring Bar That Cuts an Annular Groove

C. W. HINMAN
Chief Tool Designer, Kobzy Tool Company

WHEN one is confronted with an unfamiliar problem, such as in the design of the boring bar illustrated, he is reminded how very convenient it would be to get a "hunch" on how to do the job, but then any stunt is easy after a good way to do it has been discovered.

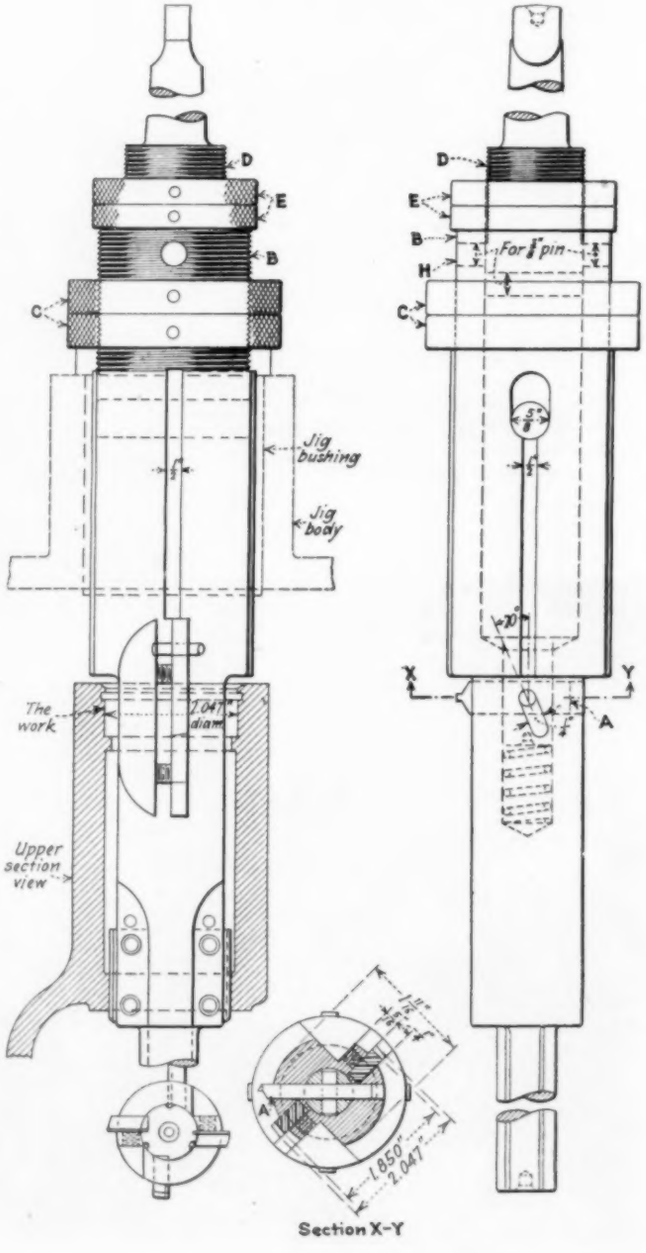
We had to bore some holes in a lot of work, such as the one indicated by the cross-sectioning in the view at the left. Besides the regular boring, an annular groove $2\frac{5}{32}$ in. in diameter and $\frac{7}{64}$ in. wide had to be cut in the upper part of the hole. Two bars were used, one for roughing and the other for finishing. The first bar roughed out the hole only. Since there is nothing unusual in this bar, it is not shown.

The finishing bar and its recessing cutter *A* are shown in the illustration. It will be observed that the largest diameter bored by any of the fixed cutters is 2.047 in., therefore the recessing cutter must finish the groove 0.0546 deeper than the largest diameter of the hole. This cutter must enter the finished wall of metal at exactly the right time and place after all the fixed cutters have done their work. These conditions were met by this tool.

The body of the bar *B* carries a pilot 0.875 in. in diameter and $6\frac{1}{4}$ in. long, which engages a bushing on the inside of the jig, not shown. On the body are four hardened and equally spaced wear strips that are ground to bear in the bushing indicated in the view at the left. Three such strips are carried by the pilot. At the upper end of the body are two round jam nuts *C*. The body is driven by a taper shank having a cylindrical extension *D*, $1\frac{1}{2}$ in. in diameter and $13\frac{3}{4}$ in. long. The drive is accomplished by a $\frac{5}{8}$-in. pin through the shank extension engaging in an elongated hole in the body.

The lower end of the extension is reduced to $\frac{3}{4}$ in. in diameter and is slotted to straddle the recessing cutter *A*. Through the recessing cutter is pressed a $\frac{1}{4}$-in. pin that engages an angular slot in the body. This slot is at an angle of 20 deg. from the vertical and feeds the recessing cutter in or out as the shank extension slides up or down, the downward movement being limited by the two round jam nuts *E*. Under the shank extension, there is a compression spring that keeps this member in its upper position, keeping the recessing cutter withdrawn from the work, which is its normal position after a $\frac{3}{8}$-in. pin has been inserted in the hole *H* through both members.

In operation, the bar is passed through the bushing in the jig. After the pilot engages its bushing, the fixed cutters begin to cut. After their work has been finished, the first stop to further downward motion of the body occurs, caused by the jam nuts *C* contacting with the shoulder of the jig bushing. Then the $\frac{3}{8}$-in. connecting pin is removed, permitting the shank extension to be moved downward through the body. The downward movement of the shank extension compresses the spring under its lower end, and through the action of the pin in the recessing cutter on the angular slot, causes the cutter to enter the work and cut the annular groove. When the cutter has cut to the correct depth, its further movement and the downward movement of the shank



extension are both arrested by the jam nuts E contacting with the upper part of the body.

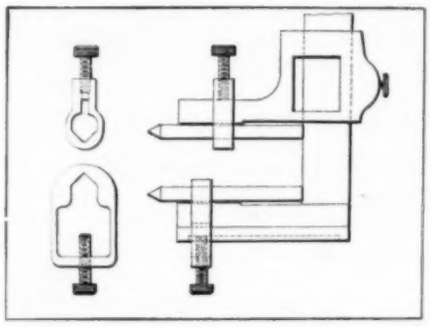
As the shank extension is moved upward, the spring holds down the body until the $\frac{1}{4}$-in. pin, working in the angular slot, withdraws the recessing cutter into the body. The $\frac{3}{8}$-in. pin is then put through the hole H in both members, and the bar is ready for boring another hole.

Clamps for Holding Scribers on the Height Gage

THEODORE KRUGER

Often, a toolmaker is required to scribe accurate circular lines or to check center distances and layouts, using the height gage. Scribers and gage pins can be held on the jaws of the height gage by means of the clamps illustrated. I made a pair of the clamps to fit my Starrett height gage. They will hold scribers or gage pins from $\frac{1}{8}$ to $\frac{3}{8}$ in. in diameter, and they will also hold a dial indicator.

In working to close center distances, the clamps must be offset in relation to one another, as indicated in the assembly. In scribing a circle from a hole, the gage pin on one jaw fits either the hole in the work, or a bushing in the hole, the scriber being held on the other jaw. For this and similar work, the height gage is used as a trammel.



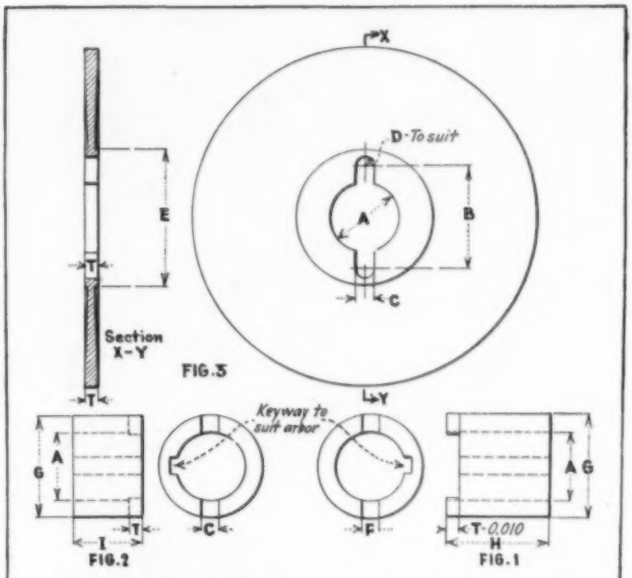
These clamps have many uses, from testing the concentricity of cutter teeth to checking and laying out work. In testing cutters, a plug to fit the hole and an indicator are all that are required. My clamps have been satisfactory on many jobs, and I feel sure that toolmakers will find them to be a worthwhile addition to their height gages.

Special Drive for Metal-Slitting Saws

VICTOR H. SMITH

In the use of metal-slitting saws to any extent in production work, especially where it is necessary to push them to the limit, it is shortly found that they have one glaring weakness. This weakness is found in the small-sized keyways that are put in many such tools regularly placed on the market. The writer has found the use of double keyways in the saws and special driving collars keyed to the machine arbor increases efficiency considerably.

In case the lugs on the driver (Fig. 1) are made to suit the thickest saw used, in using thinner saws it would be necessary to slot the clamping collar, as shown in Fig. 2, to take care of those portions of the driving lugs that would project through the thinner saws. In the furtherance of standardization, I believe it would be of



SAW-DRIVER AND COLLAR								DRIVER AND COLLAR				COLLAR
Diameter A		C to C of R. B		Width C		Radius D	Diam. E	Width F		Diameter G		Length H[Δ]	Length I[Δ]
Max.	Min.	Max.	Min.	Max.	Min.			Max.	Min.	Max.	Min.		
1.000	1.001	1.530	1.515	0.260	0.255	To suit	2	0.251	0.250	1.505	1.500	1½	1
1.251	1.250	1.905	1.890	0.321	0.316	"	2½	0.312	0.311	1.880	1.875	1⅝	1½
1.501	1.500	2.280	2.265	0.384	0.379	"	3	0.375	0.374	2.255	2.250	2¼	1½
2.001	2.000	3.050	3.015	0.509	0.504	"	4	0.500	0.499	3.005	3.000	3	2

Δ = Tolerance - plus $\frac{1}{64}$, minus 0

advantage to make the drivers to take care of the thickest saw used, in all cases, and then to slot the collar for saws of less thickness. The general details of the saw are shown in Fig. 3, except that the teeth have been omitted.

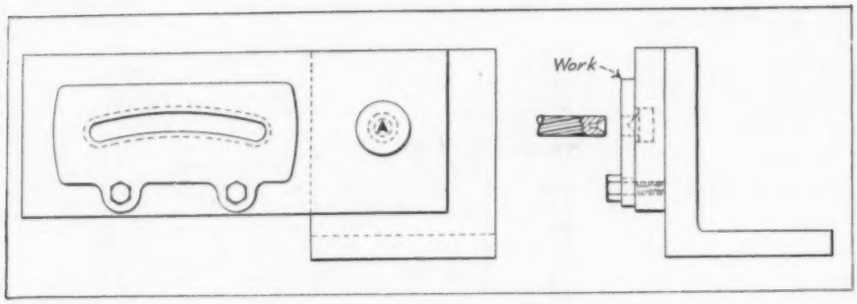
It should be noted that in all cases the letter T represents the thickness of the saw, and further, that several of the dimensions are used on more than one detail. The material to be used and the treatment for the driver and the slotted collar have been left to the discretion of the tool designer.

Milling Curved Slots

ROBERT S. ALEXANDER
Special Department
Universal Winding Company

In machining the curved slots in a lot of castings, one of which may be seen in the illustration, reasonably close limits were necessary. Since laying out the curve in the casting and following it by manipulating the longitudinal and cross-feeds in a vertical milling machine proved to be a slow and expensive process, a guide plate was made. The device consists of a hardened and ground plate having a master slot, and is pivoted at A on the vertical surface of an angle plate. The plate is also drilled and tapped for the screws for holding the work, the holes in which are jig drilled.

The usual center for supporting the outer end of the cutter arbor is replaced by a special center, the body of which fits the master slot in the plate. With the whole device mounted on the table of the milling machine, and the work in place, an end mill is inserted in the spindle, and the special center is brought up to engage both the master slot in the plate and the countersink in

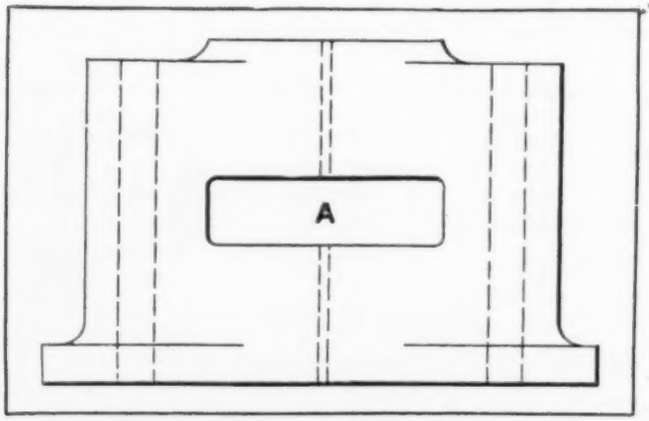


the end mill. When the table travels longitudinally, the edges of the slot ride upon the body of the special center, causing the plate to swing up and down on its pivot as it travels. It will thus be seen that the slot in the work is milled to the same curve as that of the master slot.

Boring Die Sets for Leader Pins
Discussion

DONALD RAEBURN
Glasgow, Scotland

In an article under the title given above (*AM*—Vol. 74, page 587), Charles A. Archbold described his methods of setting and boring die sets for leader pins. Discussions thereon have appeared in Vol. 74, page 875 and in Vol. 75, pages 181 and 319. The various contributors have criticized Mr. Archbold's methods as being



slow and cumbersome, requiring special fixtures and balancing, and have ignored the simple efficiency of tooling applied to the boring operation. Also, different methods and machines have been suggested.

While some of the alternative methods are more convenient than those used by Mr. Archbold, they show a similar defect, that of having to bore through interrupted surfaces without support for the outboard end of the boring bar. In Mr. Archbold's method a hardened bushing is placed in the spindle to pilot and support the boring bar, thus permitting the correct feed to be used without deflecting the bar. Where the horizontal type of milling or boring machine is used, the same precautions for supporting the boring bar can be taken, but in the case of vertical machines, the boring bar cannot well be so supported, hence deflection of the bar takes place and the feed must be reduced to counteract it.

In the method outlined by James R. Cornelius (*AM*—Vol. 75, page 181), there are no interrupted surfaces to be bored, but the necessity for counterbalancing is increased, which is objected to by some of the contributors on the subject. With the addition of a spotting piece on the casting proposed by Mr. Cornelius, as at *A* in the illustration, and with a central hole for the clamping bolt, the clamping of the work on parallel strips to the table of a vertical boring mill is simplified, and the use of bushings is not necessary.

By using a central bolt and thin strips of paper between the work, table, and parallel strips, and with a small angle plate attached to the table and in contact with the work, there is little danger of the work slipping. The use of the vertical boring mill would remove the objections raised to the question of counterbalancing, although some machinists counterbalance work on such machines as a matter of precaution.

A tooling arrangement similar to that used by Mr. Archbold, coupled with a locating pin or other simple device, would insure the accuracy and alignment of the leader-pin holes. On a vertical machine, the work is easily set. As the weight is on the table, there is no overhang as in the case of the lathe. Also, the measurement of the holes is much easier.

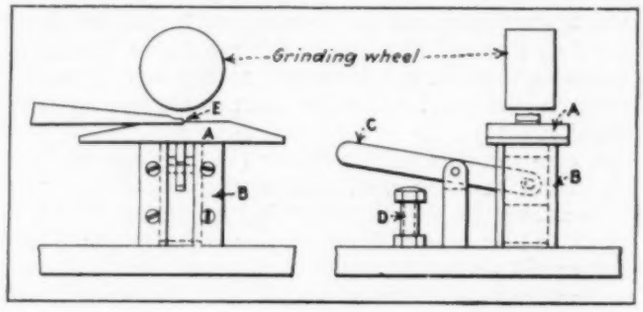
Grinding Screwdrivers Correctly
Discussion

EUGENE H. KOENIG

In an article under the title given above (*AM*—Vol. 75, page 353), John E. Orban describes the correct shape for screwdriver points and tells how they should be ground. But grinding the points while holding the screwdrivers in the hand is not as productive of good work as it might be.

A simple fixture for the purpose is shown in the illustration. The vertical member of the work rest *A* can be moved up or down in the slide *B* by the pivoted lever *C*. The upward movement of the rest is controlled by the adjustable stop *D*. All the parts are mounted upon the grinder table, the center of the work rest being directly under the center of the wheel. In operation, the screwdriver is held on the work rest with its point against a ledge that is slightly beyond the center of the wheel, as at *E*. The outer end of the lever is then depressed, moving the work rest upward so that the screwdriver is against the wheel.

Downward pressure on the lever is continued until



a certain amount has been ground from one side of the point, and the adjustable stop is set. The work rest is then lowered, the screwdriver is turned over and the work rest is again raised until the lever contacts with the stop. Thus, an equal amount has been ground from each side of the point. The operations are repeated, setting the stop between grinds, until the point is as thin as is desired. This device can be used for grinding screwdrivers of all sizes.

Universal Welding Stand

FRANK C. HUDSON

Convenience in holding work is a real factor in the time necessary to do any job. This is particularly true of welding which makes the wedding stand here illustrated of special interest. It is used in the Roanoke shop of the Norfolk & Western.

The stand consists primarily of a welded base with a roomy box at the back for welding rods. A vertical column with a rack extends through the top of the stand, the pinion for controlling its position and the handle operating it being seen at *A*. At the top of the column is a head with a worm and segment *B* operated by handle *C*. Another worm at right angles to this and operated by the ratchets *D* turns the work holding stem or mandrel *E*. This stem is provided with substantial square clutch teeth that engage the work holder *H* or any other work holding device, as seen in the other views. Work holder *H* is virtually a slotted tube with a right and left screw that controls the jaws *J*, these being shaped to hold a variety of work.

In Figs. 2 and 3, the operator is at work on small special jobs. In the first, he finds it more convenient to sit at the side of the stand and operate the treadle with the side of the right foot. This treadle actuates the ratchets and turns the work as he builds up the worn groove. The work mandrel is here shown in a horizontal position. The connection between the treadle and the ratchet telescopes to allow for different heights of the vertical column.

In Fig. 3, the work stem is tipped at an angle for greater convenience and the operator is in front of the

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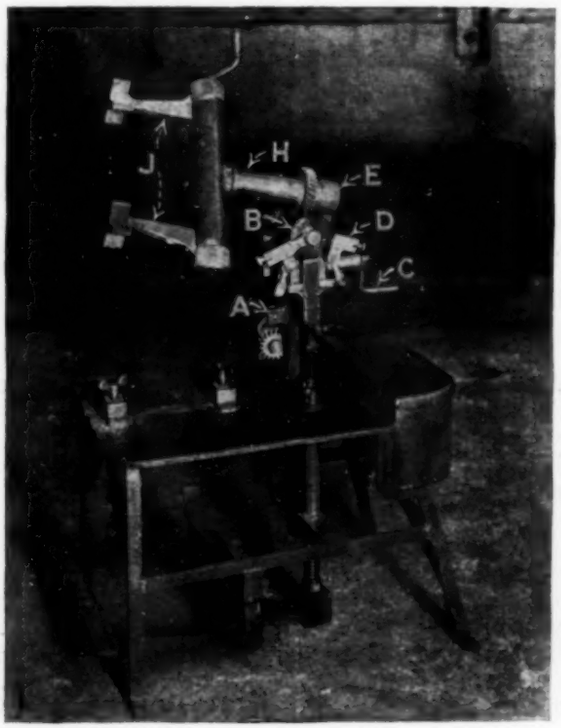


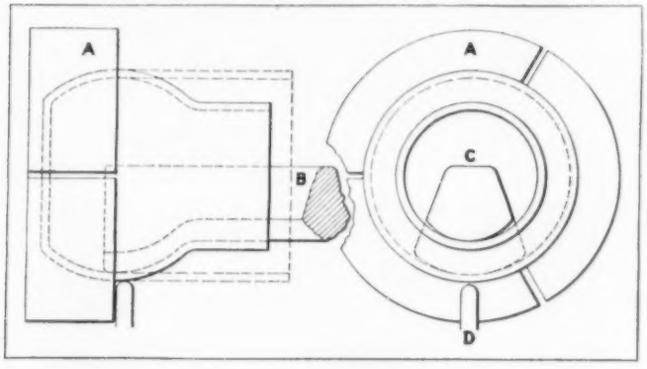
stand. The brackets and wing screws on the table are for holding special work. The special chuck in the first view is seen on the floor in Figs. 2 and 3. Such a stand as this should be convenient in any welding shop.

A Sectional Chuck for Spinning *Discussion*

HARRY SHAW
Consulting Engineer, Heywood, England

In an article under the title given above (*AM*—Vol. 75, page 26), Henry W. Boehly requests alternative ways of spinning the piece shown at *A* in his illustration.

One method is to grip the drawn blank in a chuck having three soft jaws, as at *A* in the accompanying illustration; insert the former *B*, which is fixed in the cross-slide; and spin the metal to shape with a spinning tool in the usual way, taking care that the tool is kept in the plane *C-D*. The former is of slightly less radius



than that of the inside of the work, so that it will be clear of the work except in the plane *C-D*. The corners are rounded so that the work will not be scratched should the former be inserted or removed carelessly. This method can be employed for much smaller work than can Mr. Boehly's, for his chuck consists of so many parts that it would be quite difficult to make for the smaller work.

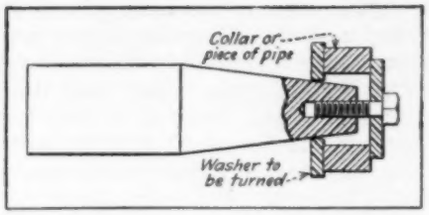
When work must be accurate, one firm spins it roughly to shape in the way described above, and then places it between two blocks that are bored to the shape and the size of the finished piece, the blocks fitting together without any space at the joints. Placing the blocks in a fixture in the lathe, the metal is spun well up into the shaped bore, using a tool much like the former *B*. By this method, an accurate piece is produced.

A Special Lathe Mandrel—*Discussion*

CHARLES KUGLER

The article under the title given above by John Phillips, Jr. (*AM*—Vol. 75, page 933), shows just how much work is required to do a little job. Small as washers are, they are difficult to hold.

The method I have been using for many years to do such work does not differ much from that described by Mr. Phillips, except that I do not use the pipe center because it is not necessary. If a hole is drilled and tapped for a screw in the end of the mandrel, the washer to be turned can be held by a collar or a short piece of pipe, as shown in the sketch. When larger washers are to be turned, wider collars or longer pieces of pipe are, of course necessary. The straight part of the mandrel can be held in the lathe chuck, or if small enough, in a spring collet. Two or three sizes of mandrels will take care of many sizes of washers.



SEEN AND HEARD

JOHN R. GODFREY

Cast Iron Milling Cutters

We speak today of obtaining ever harder cutting edges for milling cutters and now have them with blades of Stellite and tungsten and tantalum carbide. But, in looking through *American Machinist* for 1897 recently, I noticed a lengthy account of some cast-iron milling cutters used just as cast for machining parts for butt hinges. These cutters were claimed to be able to machine 20,000 pieces before being discarded, while steel milling cutters could mill but 10,000. The cutters worked so successfully that taper reamers, $\frac{3}{4}$x$\frac{3}{8}$ in. and 6 in. long, were made, with decided success. The feed, of course, cannot be too heavy.

Stud Fits

Fitting studs in the crankcase of a motor or in a similar place seems to be largely a matter of individual judgment. Taking five-sixteenths studs as an example, we find some builders allow from three to four thousandths on the pitch diameter. That is the stud is made that much larger than the tapped hole and forced in. This is usually for a cast-iron crankcase. With aluminum, an airplane engine builder recently visited allows six thousandths for the same stud. In all these cases the thread angles are supposed to be the same in both stud and hole, although presumably they are rarely exactly alike. Then too, some believe that by changing the angle a few degrees the flow of metal makes a more perfect fit.

Lack of Welding System

Welding has become a common operation in all railroad shops. But there is little attempt as standard practice, except on a single system. One large shop, recently visited, sticks to thermit. Others use gas or arc indiscriminately, one preferring gas and the next using the arc almost entirely. In the same way, the question of using bronze welding rod is far from being settled. One shop of a large system swears by it for many welds while another shop in the same system, a few hundred miles away, swears at it, figuratively speaking. One man uses manganese bronze for frame welds and the like, while the other merely uses it to build up pistons and similar work. A bit of standard practice ought to save money.

SHOP EQUIPMENT NEWS

Pratt & Whitney 26-In. Heavy-Duty Hydraulic Vertical Surface Grinder

A vertical surface grinder with hydraulic table drive has been announced by the Pratt & Whitney Co., Hartford, Conn. This 26-in. machine weighs 18 tons, and replaces the 22-in. surface grinder previously manufactured.

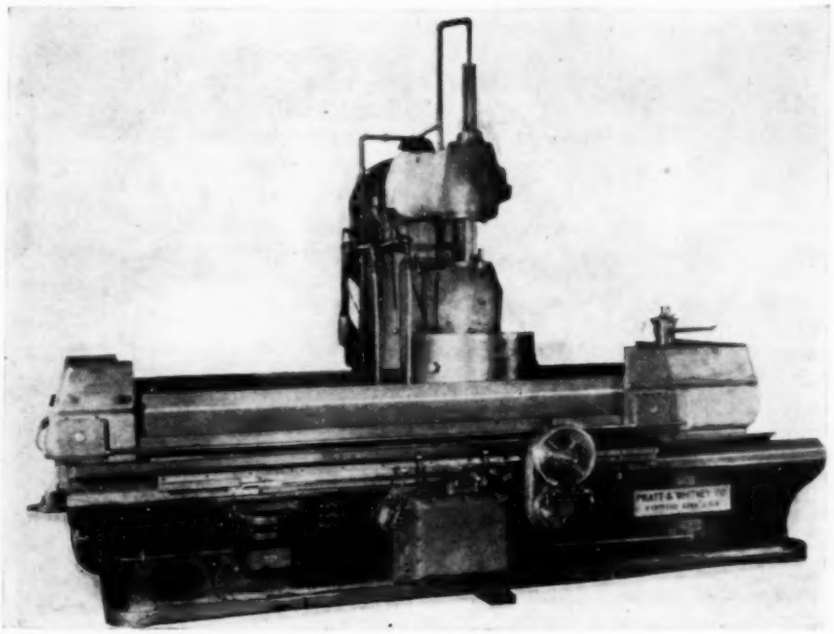
The bed carries the reciprocating table, at the rear of which is a column carrying the wheelhead and spindle driving motor. The table working surface is 18x88 in. with a maximum travel of 104 in. Distance from the table top to the wheel is 16 in., so there is ample capacity for large work. The hydraulic table drive mechanism with its 10 hp. motor is placed at the back of the bed, out of the way, but all controls are in front. Table speeds range from 30 to 175 ft. per min. Any speed within this range is available by moving a lever on the graduated speed chart. This means that should the operator not have the proper wheel at hand, he can change the speed of the table to conform more closely with the wheel he is using.

The length of stroke is set by means of table dogs of the rack and pawl type. The table can be reversed by hand at any time within the limit of the table dogs. By tripping a latch the table is brought out to the loading position and stopped automatically. The front table water guard is operated by a lever, and can be raised or lowered quickly. A graduated wheel dresser is mounted on the end table guard.

The spindle is driven through spiral bevel gears by a 75-hp., 1,150 r.p.m., constant-speed motor, producing a spindle speed of 750 r.p.m. The wheel spindle has a large flange forged on its lower end. This affords more safety and rigidity than can be obtained with a faceplate. The wheel chuck is attached directly to this flange. The spindle is mounted in anti-friction bearings and is lubricated from a reservoir at the top. A convenient hand-brake is arranged for quick stopping.

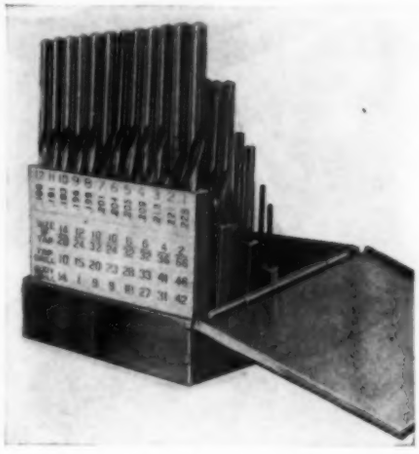
The wheelhead is fed down at each end of the table stroke. Feed per stroke is regulated by a graduated shield over the wheel-feed ratchet, and the total amount of feed is set by a graduated dial on the wheel-feed handwheel. Wheel feed is operated hydraulically, but it can be operated by a handwheel if desired. Power feeds range from 0.00025 in. to 0.005 in. The segmental wheel is surrounded by heavy guard which is arranged so that the wheel segments can be adjusted or removed easily.

Coolant is supplied from a 350 gallon tank. A pump driven by a separate 2 hp. motor sends the coolant through the wheel spindle and also through a pipe line to the outside of the wheel. An additional line supplies water for washing off the chuck. All three motors are controlled by a push-button station located at the front of the machine within easy reach of the operator.



Huot Drill Index

A drill stand and container with tap information on the face is being offered by the Huot Manufacturing Co., St. Paul, Minn. The box is



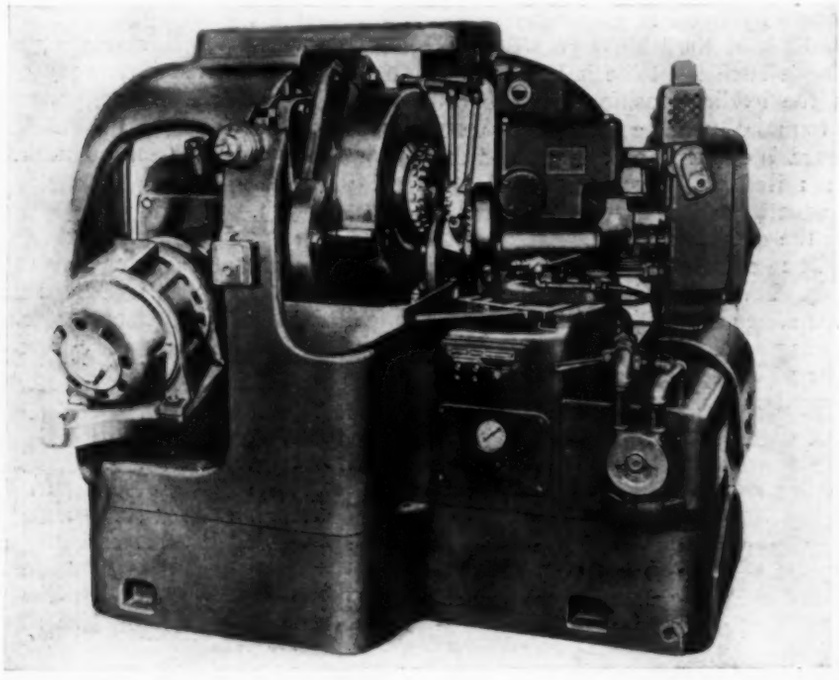
made of cadmium-plated steel and the panels of drills fold into it like the pages of a book. Holes are individually drilled to give a snug fit so that the drills will not fall out of place, even though shortened by repeated sharpening.

The drill index is made in three

sizes: No. 29 for fractional drills from $\frac{1}{16}$ to $\frac{1}{2}$ in. by 64ths; No. 60 for wire gage sizes from Nos. 1 to 60; and No. 13 for fractional drills from $\frac{1}{16}$ to $\frac{1}{4}$ in. by 64ths. When folded, these containers take up very little room in the tool kit and may be carried in the pocket. The No. 60 index, for example, has outside dimensions of $3\frac{1}{4}$x$4\frac{1}{2}$x1 in.

Gleason No. 10 Spiral-Bevel Gear Roughing Machine

Capacities for gears up to $5\frac{1}{2}$-in. cone distance, 8 to 1 ratio, 11-in. pitch diameter and 3 D.P., are embodied in the No. 10 spiral bevel gear rougher developed by the Gleason Works, 1000 University Ave., Rochester, N. Y. The machine is similar in construction to the No. 20 spiral bevel gear rougher, but is designed for gears of a smaller size. Gears can be rough cut on this machine in less than half the time formerly required for this operation by the use of higher feeds and speeds and by reducing the chucking and unloading time. The operator has only to remove the gear, which is automatically dechucked and ejected, and then put in a new blank and turn a handle. The gear is automatically chucked and moved into cutting position.



Greater rigidity and operation has been obtained by the use of the overhead tie, heavy sections for the castings, and by securely clamping the work spindle during the cutting operation. Motors are mounted in the machine and coupled direct. The operating controls are grouped conveniently.

No generating motion is employed, the tooth slots being cut by a simple depth feed motion of the cutter. After each slot is cut, the cutter is withdrawn to permit the work to be indexed for the next cut.

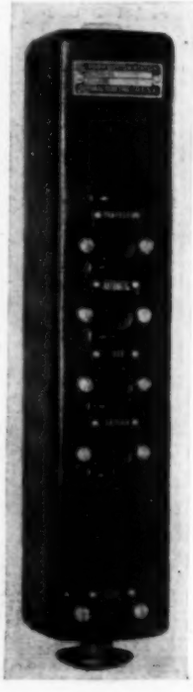
The cutter spindle is mounted in a saddle in the upright. The entire saddle assembly is adjustable both horizontally and vertically for setting the cutter to the proper spiral angle. Feed movement of the cutter spindle is all on the spindle sleeve, in which the cutter spindle is journaled. Depth of feed is varied by an adjustable stop screw. The cutter is driven through a pinion driving an internal gear bolted to the cutter-spindle faceplate. Change gears for obtaining various cutter speeds are located conveniently. The heavy flywheel on the spindle faceplate makes for smooth cutting action.

The workhead is mounted directly on the frame and has the usual angular and linear adjustments to accommodate gears of various pitch angles and cone distances. The work spindle remains stationary during the cutting operation, except when the work is indexed. Gears are chucked by being drawn back against a shoulder on the arbor by a draw-rod. The work is held in place by a spring, which is automatically released when the head backs away from the cutter after the last tooth is roughed out. The gear is also ejected from the arbor and the operator has only to lift it from the spindle. The draw-rod is adjustable for length, and the chucking mechanism, except for the arbor, can be used for any gear of standard design. The index mechanism is of the notched-plate type and is actuated automatically. The machine is arranged for 6-, 9- and 12-in. cutters.

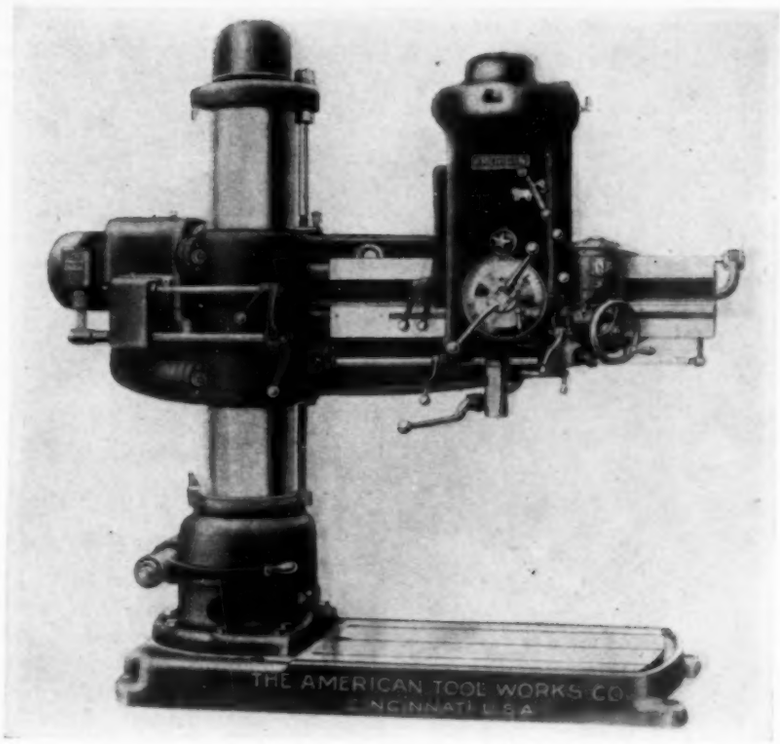
General Electric Pendant-Type Pushbutton Station

Pendant-type, momentary-contact pushbutton stations, designated as Type CR-2940, have been announced by the General Electric Co., Schenectady, N. Y. This line is particularly designed for the control of motors driving machine tools such as planers and boring mills. The stations may be fitted with sufficient cable so that they can be readily carried around by the operator.

The momentary-contact pushbutton unit provides both a normally-open and a normally-closed circuit. All of the buttons except the "stop" buttons are protected from accidental operation by means of a guard at the bottom of the button. The stop button is mounted on the bottom of the case and has a mushroom head which makes it easily accessible in case of emergency. A nameplate over each button clearly indicates its function. The round-corner inclosing case is made of cast aluminum alloy with a black japan finish.



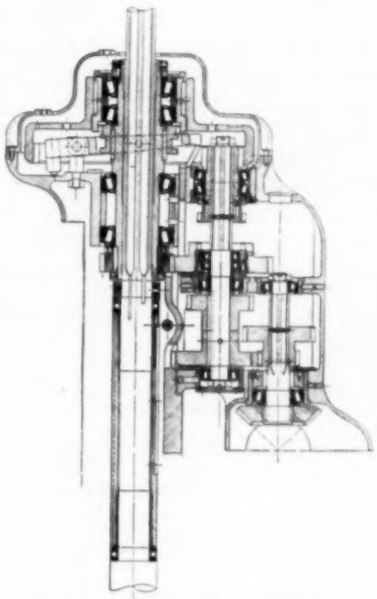
"American" Improved Triple-Purpose Radial Drilling Machines



American 4-ft. Arm, 13-In. Column Size Radial Drilling Machine

Several improvements designed to increase the accuracy and versatility of its radial drills have been made by The American Tool Works Co., Cincinnati, Ohio. The head is now equipped throughout with anti-friction bearings. The spindle is mounted in ball bearings and the remainder of the bearings are Timken tapered roller bearings. All shafts, including the spindle, are of alloy steel, heat-treated, ground and multiple splined. The handwheel at the right for moving the head is set at an angle for convenience of operation, and the hand feed wheel is automatically disconnected when the power feed is in use. The latter eliminates the objectional feature of the handwheel revolving when using the power feed, and thus does away with accidents from this cause.

The improved elevating mechanism is controlled from the head and is accident proof. The arm is clamped and unclamped, raised and lowered through the elevating lever located at the head, directly in front of the operator. When the control lever is raised for elevating the arm, the arm clamp is automatically released before the elevating mechanism becomes operative. The same is true when lowering the arm. One of the features incorporated in this elevating mechanism is the brake, which automatically operates on the elevating gears and prevents the arm from coasting after the elevating mechanism is disengaged. The other feature is the safety clutch provided on the elevating screw, to disengage the arm if it meets an obstruction when being lowered. The usual safety stop dogs are also embodied on the elevating shaft. Anti-friction bearings are used throughout the mechanism.



Cross-section of the improved anti-friction head

All operating levers have been centralized and grouped to afford convenience. For example, the gearbox speed control levers have been extended to the arm girdle, where on smaller size machines they can be reached without moving from the operating position. On the larger sizes no more than one step is required to reach them. Speed and feed controls on the head are grouped to afford ease of operation, and two levers are furnished for raising and lowering the spindle.

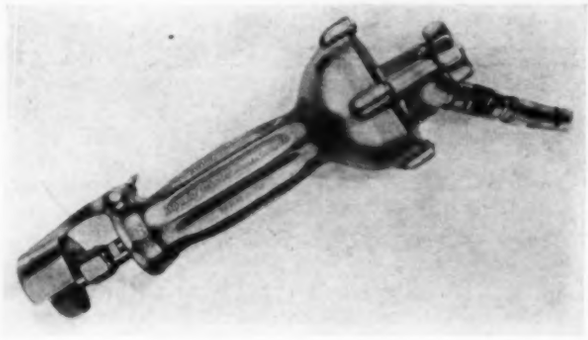
The improved tapping attachment makes use of a combined spring steel and fiber friction band contacting with the hardened and ground surface of the friction cup. The fiber friction band has a greater coefficient of friction than cast iron, and the life of the unit is further protected by the spring steel band, which causes the friction band to snap away from the friction cup immediately when released, thus eliminating drag. The whole tapping attachment unit is mounted on large ball thrust and radial bearings.

Sentry Non-Metallic Hardening Tray

The Sentry Co., Taunton, Mass., has developed a non-metallic tray to be used in connection with it "Diamond Blocks" for the hardening of high-speed tungsten, molybdenum, and cobalt steels. These trays are not affected by the neutral atmosphere produced by the Diamond Block, regardless of the time element. With the use of the non-metallic trays, it is claimed that high-speed tools can be hardened in such a manner as to retain the original surface free from scale, soft surfacing, or carburization.

Madison-Kipp Model DD Air Grinder

A larger high-speed air grinder for general toolroom service has been added to its line of air tools by the Madison-Kipp Corp., Madison, Wis. This Model DD one-hand grinder will take grinding wheels up to 1½ in. in diameter and operates at a speed of 30,000 r.p.m. It is intended for larger work in general toolroom service, such as making and repairing forging dies, punch press dies, die-casting dies, tools, jigs and fixtures. To a greater extent than is the case with the smaller tools, this model is adaptable to production work and light snagging. Other uses are special internal grinding, machine repairs, gear repairs, grinding welded joints, and auto body grinding.

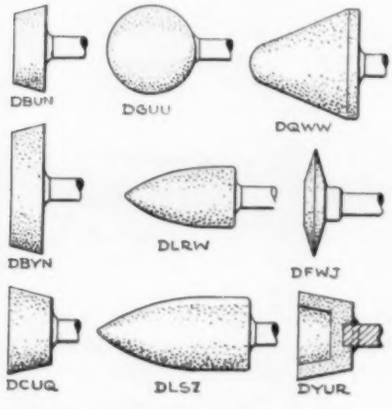


The shape of the grinder makes it especially adaptable to one-hand grinding for accurate work without fatigue. The length is 9¾ in., and the weight is 2½ lb. A speed of 30,000 r.p.m. gives best grinding results consistent with factors of safety of the larger wheels employed. The speed control automatically maintains the speed through the wide range of shop air pressures of 50 to 120 lb. per sq.in. The control is of the steel-finger type and is made of chrome-vanadium spring steel. The steel fingers, actuated by centrifugal force, automatically valve the exhaust air ports in such a way as to maintain a correct air-flow when the grinder has reached its established maximum speed of 30,000 r.p.m.

Low cost and low weight of the tool is made possible by the use of an extensive number of die castings. The body, back plate, rotor, connector and other parts are die cast. The rotor is die cast of magnesium alloy to give extreme lightness and balance, to provide fast pick-up, to eliminate vibration and to reduce the gyroscopic action prevalent under certain conditions when a mass revolves at a high rate of speed. The exhaust valve cage, which is a part of the speed control, is also made of magnesium.

Oiling of this grinder is accomplished by means of the Kipp syringe pressure oiler, which is inserted into the collet end of the hollow spindle, from which radial holes lead to the bearings. With one push of the handle of the lubricator, the grinder is oiled. Another feature is a removable wheel guard, which is standard equipment. This guard can be removed quickly for internal grinding. To connect and disconnect the grinder from the air hose is a matter of only one short twist.

Special Kipp wheels are used with this grinder. These DD wheels are made in nine shapes, 32 cylindrical sizes, and four grades. The first grade is for fast steel grinding, the second grade for light steel grinding, the third for cast iron and soft metals, and the fourth for non-metallic materials.



Nine shapes and 32 cylindrical sizes of Kipp DD wheels are available for use with the Model DD Air Grinder

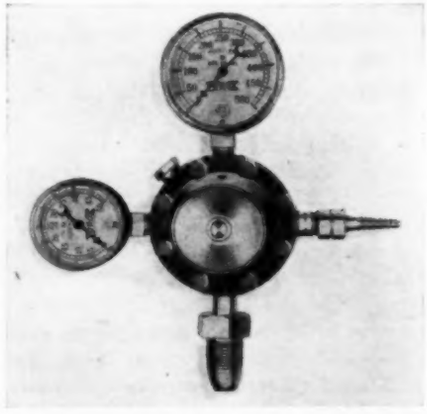
"Rust-Tox" Rust-Preventive Liquid

The Skybryte Co., 1919 E. 19th St., Cleveland, Ohio, has developed a rust-preventing liquid known as "Rust-Tox." The dried coating is glossy and transparent. In refinishing rusted surfaces, it is only necessary to brush off the loose scale and paint or spray with the liquid, which is said to absorb all the moisture content in the rust and to make it chemically inert. If desired, Rust-Tox may be pigmented, and is a vehicle for aluminum flakes, red lead, or graphite. It is heat-resisting up to temperature of 550 deg. F. and resists acid fumes, smoke, salt air and oxygen. It can be sprayed or brushed at any temperature above 35 deg. F. Rust-Tox covers about 1,500 sq.ft. per gal., depending upon the porosity of the surface. It is said to have the advantage of "baking on" instead of burning out under the heat of riveting. Therefore, it leaves air-tight and water-tight joints under rivet heads and plate joints.

"Purox" Oxygen and Acetylene Regulators

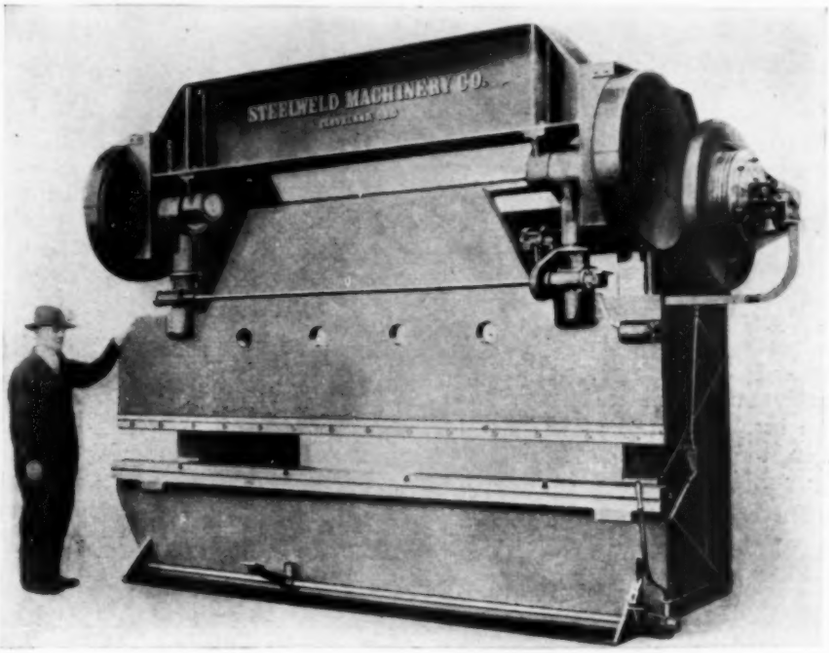
The Linde Air Products Co., 30 E. 42nd St., New York, N. Y., has introduced an entire series of improved "Purox" oxygen and acetylene regulators superseding its former line of "Purox Metal Master" regulators. All Purox welding or cutting outfits now include these regulators.

The series comprises six regulators,



designated as Nos. 33 and 34 for acetylene; Nos. 13, 14, 23 and 24 for oxygen. All regulators have the same general external appearance. They are of all-metal construction. An important element is an accurate self-aligning valve of the nozzle and yoke type, insuring sensitive action and freedom from leakage. Access to the interior of the regulator is gained by merely removing a plug in the rear of the body, which is particularly handy when replacing a worn valve seat.

"Steelweld" All-Steel Bending Brakes



Welded-steel construction is employed for the line of bending brakes announced by The Steelweld Machinery Co., E. 70th St., & Machinery Ave., Cleveland, Ohio. The housings are cut from rolled steel plates and are built up into welded sections. The members in the throat are heavily built and so arranged that deeper throats can be supplied, if desired. Conventional design is otherwise employed in the machine in that power is applied through overhead eccentrics to the movable and adjustable ram. Both the ram and the bed are of ample depth and are overhung at one end, giving advantages in jobbing work as well as longer die surface for narrow work.

The clutch employed in these brakes is of twin-disk design, and the operating levers move on ball bearings. All gears are of steel, the high-speed gears being of Sykes herringbone type.

One of the features of these bending brakes is the ball-joint connection, which is claimed to be unbreakable. Slide bearings and eccentric straps are of Meehanite iron. The flywheel is of rolled steel and is mounted on Timken bearings. High-carbon alloy steel is used for the flywheel shaft, and the pinion is forged integral. Eccentrics are forged solid with the mainshaft. Adjusting screws are of heat-treated, high-carbon steel.

Power elevation to the ram is electrically operated and is self-locking. The motor is arranged to stall before damage occurs to the mechanism. Pressure grease lubrication is provided to the bearings in the machine from a central location. Longer strokes, deeper throats, greater die clearances or width of bed and ram are obtainable readily.

"Spekker Steeloscope"

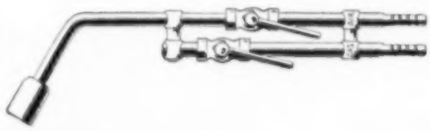
The Riehle Bros. Testing Machine Co., 1424 North 9th St., Philadelphia, Pa., has been appointed exclusive representative in the United States and possessions, British Columbia and Mexico, for the "Spekker Steeloscope" manufactured by Adam Hilger, Ltd., London, England. This instrument is a specialized spectroscope for the rapid estimation of metallic elements in steels. It can be used for the rapid sorting and checking of steel in stock, purchases and scrap, and for general control of production.

The Steeloscope has but one adjustment, the observation of the various metals being provided for by an eyepiece which can be moved to definite positions indicated by engraved chemical symbols. At each position can be seen the most distinctive spectrum lines of the metal whose symbol is inscribed. The apparatus consists of two tubes joined by a metal body. The tube to the left is provided with a glass window, which is directed toward the specimen under observation. Immediately behind the glass window is a narrow slit through which the light from the specimen passes into the Steeloscope, and is there spread out by means of the optical system into its constituent radiations. The body contains the prisms which produce the spectrum. An iron bar free of the element sought is placed in contact with the specimen and then separated slightly to strike the arc, which is furnished by direct current. After the slide on the right-hand arm is set to the element sought, if the element is present, spectrum lines will be seen when looking in the eyepiece. By comparison of the number of spectrum lines with maps of spectrums supplied with the instrument, it is possible to estimate the percentage of the element in the specimen.

Spekker Steeloscope

Torit Natural-Gas Blowpipes

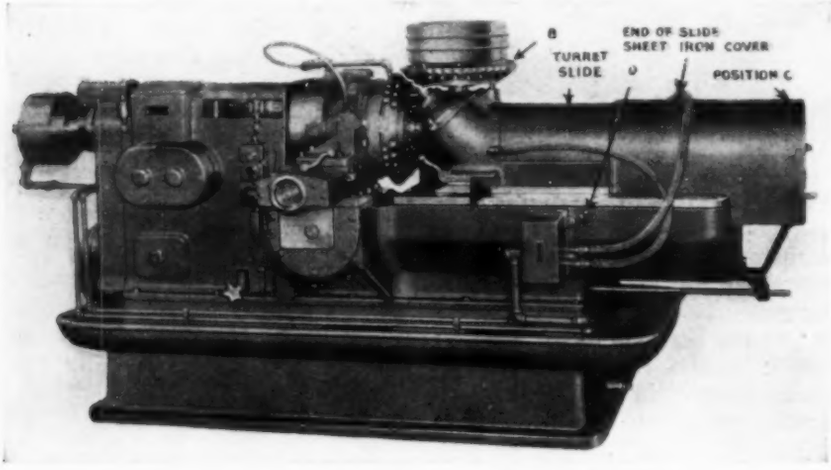
For use in localities where natural gas is supplied instead of manufactured gas, a line of blowpipes to give satisfactory operation under these conditions is being placed on the market by the Torit Mfg. Co., 174



West Third St., St. Paul, Minn. These blowpipes are claimed to give good results on any grade of natural gas together with compressed air. The blowpipes will operate on coal gas as well. They are supplied for soldering, light brazing, tempering, melting, rebabbitting, wire splicing, core drying and various operations requiring heat, but not for welding. Adjusting the air and gas valves gives a small, hot flame, or a large, soft one.

Sundstrand Brake Drum Splitting Machine

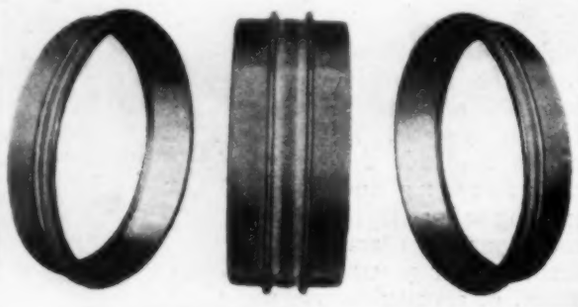
Among recent developments in automotive construction is the cast-iron or special alloy brake drum. With some manufacturers this takes the form of a lining centrifugally cast into a rolled steel shell. In one type the shell is made from a special double-width rolled-steel section.



This material is cut off to length, rolled to form and electrically welded, after which the alloy iron is centrifugally cast into place. The rolled section is then split or parted, making two brake drums.

The splitting or parting of the double-width shell is an operation that requires tools first to machine the steel shell, then the weld or bond and finally the cast alloy iron. The Sundstrand Machine Tool Co., Rockford, Ill., has developed a machine especially for this purpose. In this machine the operator places the assembly consisting of two drums on the loading platform and the work carrier *B*. He then turns the carrier by means of a knurled ring, which operates a 3-jaw scroll chuck to grip the piece tightly from the inside, so that after the parting tools have completely split the assembly, both parts are held securely and eliminate possibility of tool breakage.

In the accompanying illustration the machine is shown with the slides in the forward position, the drum having been split. The slides then automatically return on rapid traverse to the loading position. Movement of the slides automatically releases the air and causes the chuck to open, the movement of the chuck draw rod automatically operating a limit switch and causing the spindle to stop. When the cut-off slides are finally returned, valve *D* is automatically operated. This causes the turret slide to return to position *C*, and turret *B* automatically indexes 180 deg., bringing the two halves to the unloading position and the assembly to the chucking position. The operator again operates valve *D*, causing the turret slide to approach and automatically place the assembly into the chuck jaws where it is automatically clamped. The operator then presses the starting button.



Double-width brake drum section with centrifugally cast lining, and two drums after being split on the above machine

The work-holding device on the loading turret revolves with the spindle, gripping the part lightly on the inside by spring-loaded jaws, in order that the chuck which grips the part from the outside may compensate the work.

Four "J Metal" tools are used for the cutting-off operation. Two tools are mounted in the rear slide and two tools in the front slide. In each case, one tool is mounted directly over the other, the top tool being set slightly in advance and ground for maximum tool life, and the bottom tool finishing the sides of each half. The slides are so timed that the rear slide is set ½ of the feed per revolution in advance of the front slide, and thereby the total advance per revolution is twice that of the feed used on each slide.

Correction

Through an oversight, the illustration at the left was published with the announcement "Rockford Automatic Hydraulic Burnishing and Grooving Machine" in the Jan. 28 number. The Rockford announcement is republished in full with correct illustrations on the next page.

"NK&B" High-Speed Milling Head

Double pivot construction is used in the high-speed milling head, announced by Neff Kohlbusch & Bissell, 2400 West Madison St., Chicago, Ill., and makes possible the positioning of the spindle to any angle and at any height within the scope of the two centers. This allows the cutter to be used at a point below the regular spindle of the milling machine, and also at a point practically flush with the bottom of the overarm. The unit is powered by a ball-bearing, ⅛-hp., 1,725-r.p.m. motor, pivotally mounted

N. K. & B." High-Speed Milling Head, which is pivotally mounted

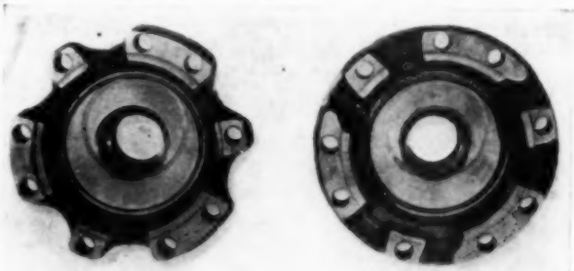
and driven through a V-belt and aluminum 4-step pulleys. The device has an available range of speeds of 800, 1,400, 2,400 and 4,000 r.p.m. All four bearings are mounted in a ground and lapped steel sleeve, which lines the housing for its full length, and the bearing mounting is such as to compensate for changes in spindle length due to temperature changes.

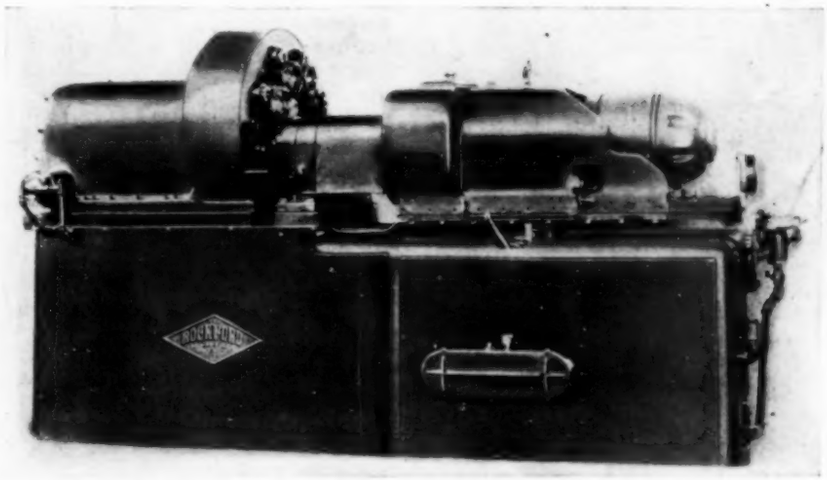
The spindle is of tool steel, hardened and ground to the full length. It accommodates collets of $\frac{3}{8}$-in. capacity. Brackets to fit the user's requirements are furnished for either the circular or the dovetail type of overarm. The collets are designed with an extremely small included angle, giving a positive hold on the cutter. A safety device is incorporated in the switch, which is placed near the spindle nose, making it impossible to apply power to the motor with the spindle locked. The machine can also be used for rotary filing.

Rockford Automatic Hydraulic Burnishing and Grooving Machine

The Rockford Drilling Machine Co., Div. of Borg-Warner Corp., Rockford, Ill., has developed an automatic machine for surface burnishing and grooving of two parts at a time. The machine head and indexing drum fixture are automatic in operation and the speed of the machine is adjusted to the ability of the operator.

Two parts of the type shown are loaded and unloaded at the idle stations, of which there are two for convenience. While loading is being done the two parts at the first working station have the oil groove cut in them, and the two parts at the second working station are burnished. The machine head feeds forward to cut the groove, and builds up sufficient pressure for the burnishing operation. It then returns to the starting position. At the same time the fixture drum indexes one station, and locates itself accurately. The machine continues to function in this manner until stopped. A 7-sec. cycle is possible.



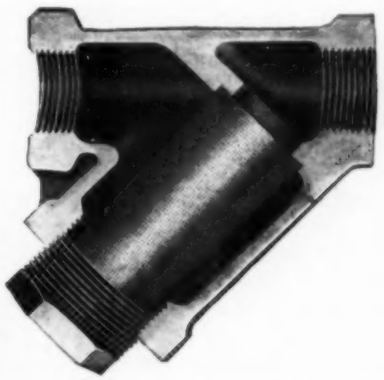


Design of Machine

A $7\frac{1}{2}$-hp. motor drives the machine head through gearing to the spindles. Four spindles for the above noted operations are mounted in Timken roller bearings. All working parts in the head are lubricated by an oil bath. The special grooving and burnishing tools are guided by bushings carried in a separate bracket mounted on a machine base. The indexing fixture drum is also mounted on a large Timken roller bearing and is operated hydraulically, locating itself accurately at each station. Machines of this type are available in various sizes and arrangements.

Marsh Self-Cleaning Pipe-Line Strainer

A self-cleaning strainer for installation on the return line of low, medium and high-pressure systems up to 125 lb. per sq.in. has been developed by Jas. P. Marsh & Co., Chicago, Ill. This strainer will eliminate dirt, grit and scale, and can be installed either horizontally or vertically. It is self-cleaning and draining when the plug is out or the blow-off valve is open.



The body and strainer plug are of cast iron. The strainer cylinder is a perforated truncated cone, and for steam, water, air, gas and oil is made of brass with $\frac{1}{16}$-in. perforations. For other services cylinders of special metals and with special perfora-

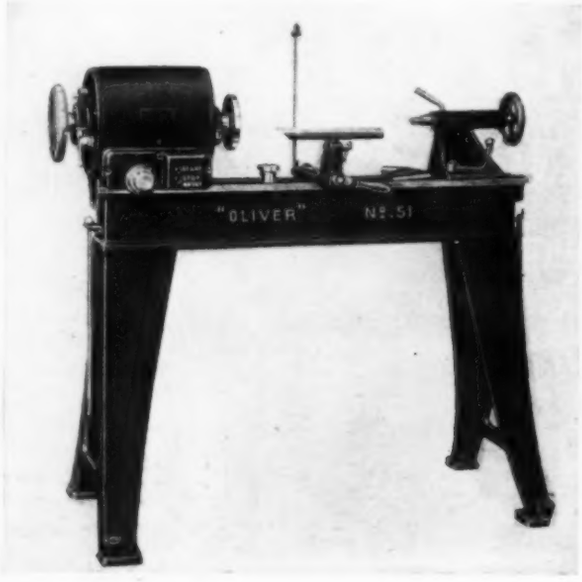
tion sizes can be supplied. The strainer is made in six sizes, ¼, ¾, 1, 1¼, 1½ and 2-in. pipe sizes. All sizes are made with a ½-in. blow-off connection.

Oliver No. 51 Motor-Headstock Lathe

For use in schools and pattern shops, the Oliver Machinery Co., Grand Rapids, Mich., has developed the No. 51 motor-headstock lathe, which has a swing of 12 in. The headstock contains a built-in, ½-hp. ball-bearing motor, and the speeds are 600, 1,200, 1,800 and 3,600 r.p.m. A built-in control located at the front side of the headstock includes start and stop buttons, a speed change lever and overload and low-voltage devices. The start button will start the motor at 600 r.p.m. only. Failure to set the speed device at a definite speed position will automatically stop the motor. A mechanical brake with automatic cut-out switch is provided to bring the machine spindle to a stop quickly.

To eliminate the disadvantages of the old drum-type control, a new principle is employed in that a stationary plate carries permanent contact plugs, which are fastened to all of the motor wires. A sliding plate carries spring-loaded contact plugs which are connected to the control switch and the power lines. Power is shut off from the controller while the handwheel locates the sliding plate at any one of the four speeds desired.

The spindle is a steel tube 1¼ in. in diameter and ½ in. in internal diameter. A plunger-type positive lock may be pressed inwardly to engage one of the three equidistant slots in a disk keyed on the spindle inside the motor. This lock gives a positive method of locking the spindle for removal or tightening of faceplates. A combination handwheel and faceplate is another feature. A hand-feed tool carriage with crossfeed and compound swivel rest may be furnished with this lathe. The crossfeed is 5½ in.



• PATENTS •

JANUARY 12, 1932

Metal-Working Machinery

Milling Machinery. Walter D. Archea, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co. Patent 1,840,300.

Spindle Rotating Means for Milling Machines. Frank O. Hoagland, Bridgeport, Conn., assigned to Pratt & Whitney Co. Patent 1,840,361.

Method of and Apparatus for Arc-Welding. Cecil C. Peck and Theophil E. Jerabek, Cleveland, Ohio, assigned to The Lincoln Electric Co. Patent 1,840,600.

Arc-Welding Mechanism. Cecil C. Peck, Cleveland, Ohio, assigned to The Lincoln Electric Co. Patent 1,840,601.

Metal Working Machine (Press). Bruno A. Briest, Toledo, Ohio. Patent 1,840,657.

Metal Cutting Machine (Saw). William H. Welch, Rochester, N. Y., assigned to Cochrane-Bly Co. Patent 1,840,684.

Apparatus for Grinding Cylindrical Surfaces. Marsden C. Hutto, Detroit, Mich., assigned to Hutto Engineering Co., Inc. Patent 1,840,720.

Work Handling Mechanism for Grinding Machines and the Like. Carle J. Highberg, Worcester, Mass., assigned to The Heald Machine Co. Patent 1,840,841.

Cam Locating and Staking Machine. George E. Tubbs, Hillsdale, Mich. Patent 1,840,990.

Cutter Grinding Machine. Joseph Gstyr, Rochester, N. Y., assigned to Gleason Works. Patent 1,841,244.

Processes

Method of Making Curved Metal Sections. Fred E. Kling, Youngstown, Ohio. Patent 1,840,512.

Metal Working Process. Charles R. Short, Dayton, Ohio, assigned to General Motors Research Corporation. Patent 1,840,641.

Tools and Attachments

Mechanism for Truing and Dressing Grinding Wheels. Ferdinand J. Hohnhorst and Ferdinand J. Kroeger, Covington, Ky. Patent 1,840,718.

Counterboring Tool. Edward Ostlind, Oakland, Calif. Patent 1,840,736.

Arc-Welding Mechanism. Cecil C. Peck, Cleveland, Ohio, assigned to The Lincoln Electric Co. Patent 1,840,737.

Tool Holder. Clarence S. Withers, Lancaster, Pa., assigned to Latrobe Tool Co. Patent 1,840,801.

Workholding Clamp. Henry W. Mass, Rochester, N. Y., assigned to National Tool & Machine Co. Patent 1,841,196.

• TRADE PUBLICATIONS •

GEARMOTORS. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued Leaflet 20536 on "Gearmotors," consisting of speed reducers combined with induction motors into general-purpose unit drives. Information on application and operation, details of construction, a listing of sizes and speeds, and dimensions are contained in the leaflet.

HARDNESS TESTING INSTRUMENTS. The R. Y. Ferner Co., 1131 Investment Bldg., Washington, D. C., has issued circular H-1, describing two types of portable hardness testing instruments. One is the Duroskop pendulum-type hardness tester, and the other is the Dwarf Brinell press. Both items have been described in these pages.

PROFITS VS. COMPETITION. The National Association of Manufacturers, 11 W. 42nd St., New York, N. Y., has published a paper "Profits versus Competition" based upon information obtained from a questionnaire survey addressed to more than 10,000 manufacturers. It traces the rise in distribution costs and discerns between the true cost of distribution and the cost of competition. Single copies of this pamphlet are available without charge, but quantities are supplied at the rate of $0.15 per copy.

The Motorizer. The Lincoln Electric Co., Coit Rd. & Kirby Ave., Cleveland, Ohio, is now publishing *"The Motorizer,"* Vol. 1, No. 1, appearing December, 1931. The contents of this publication will be devoted solely to the design, construction, operation, application and maintenance of a.c. induction motors and their controls. The publication consists mainly of questions by readers and answers, and an article on some electrical design feature of motors.

American Machinist
Reference Book Sheet

MODIFIED CONVENTIONAL SYMBOLS FOR WELDING

	Geometrical Representation		Graphical Symbols	
	Elevation	Section	Elevation	Section
Butt-joints				
No bevel (thin sheets)				
Single V				
Double V				
Lap-welds				
Continuous weld				
Intermittent weld				
Strap-welds				
Continuous weld				
Tee-welds				
Continuous weld				
Intermittent weld				
Intermittent weld on alternate sides				
Continuous and intermittent weld				
Continuous weld with bevel				
Angle-welds				
Simple weld				
Reinforced weld (composite)				

FIG. 1 (Above) D.I.N. (German) Symbols for weld designation, and FIG. 2 (below) D.I.N. Symbols grouped according to type of weld

Fillet-welds	
Standard weld	
Watertight weld	
Butt-welds	
	Unmachined Welds / Machined Welds
No bevel, thin sheets	
Single V	
Double V	
Single plate, single bevel	
Single plate, double bevel	

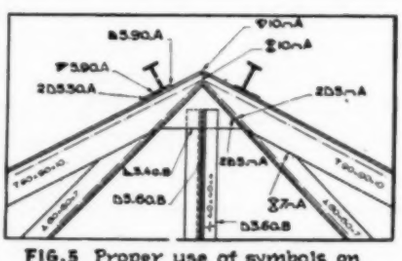


FIG. 5 Proper use of symbols on structural drawing, showing welds to be made in shop, on ground, and in place

Fillet-weld	Shop-welds	Welds executed on ground at site	Welds executed in position on structure
Standard weld			
Watertight weld			
Butt-welds	Machined Welds		Unmachined Welds
No bevel (thin sheets)			
Single V			
Double V			
Single plate, single bevel			
Single plate, double bevel			

FIG. 3 Modified Conventional Symbols for Welding

Following the lead of the American Welding Society, various European countries have initiated and accepted conventional symbols for the representation of welds in drawings. American symbols are given in "Welding and Cutting Nomenclature, Definitions and Symbols." In "Arcos," Belgian welding publication, September, 1931, and translated in "The Welder" (British), December, 1931, there appears the table of modified conventional symbols shown in Fig. 3.

According to this latter article, recent progress in welding has made some modification of conventional symbols necessary. The Belgian, German, and American tables endeavor to distinguish between different kinds of welds and also between different kinds of joints—an outgrowth of the early use of welding only for boiler and tank work. Further, no information is given as to the size of weld desired. Thus, symbols giving size, location, type and place of fabrication of welds are needed, symbols which are easily interpreted and yet compact enough for assembly drawings.

Symbols can be located at a distance from the weld, with an arrow pointing to the weld, as is done in "flagging" directions on a drawing. This likewise permits the putting in of weld dimensions. First is listed the transverse dimension (thickness of plate in butt welds or side of right angle of the triangle in fillet welds), next, and separated by a period, the length (omitted if welds are continuous—in which case a horizontal line replaces this dimension). For intermittent welds the dimensions would be given in the form of a fraction, the numerator representing the length of welds, the denominator the free space between welds. Where one weld is in front of another in the drawing, thus obscuring the rear one, the figure "2" would be inserted before the conventional symbol. For shop welds the symbol would be simply an outline—those to be done on the ground at site would be indicated by filling in half the symbol, those to be done in position on the structure would be indicated by a completely filled in symbol. The type of electrode or welding rod, if several types are to be used on one job, would be indicated by a letter or figures immediately after the length designation, or could be indicated by one, two or three circles drawn around the symbol.

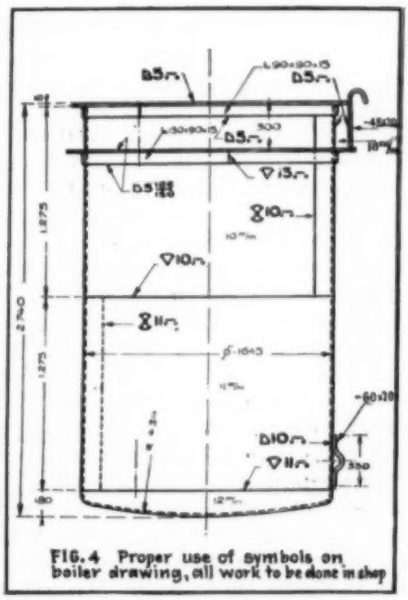


FIG. 4 Proper use of symbols on boiler drawing, all work to be done in shop

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Reciprocating Feed for Punch Presses

HERBERT CHASE
Consulting Engineer

A feed for cardboard that may be used equally well for metal plates and disks

BLANKS already cut from sheet stock are ordinarily fed to a punch press by hand. It is quite possible to increase the rate of feed, however, if a mechanically-operated feed mechanism is employed. Such a mechanism requires less attention by the operator, and enables him to handle two or more presses simultaneously in some instances.

A feed mechanism of this type, which has been operated successfully over a considerable period, is used by Adartcraft, Inc. The design is the work of L. E. Shaw, to whom the writer is indebted for the drawing and particulars here given. As applied at present, the mechanism is employed for feeding blanks of paper board about 0.060 in. thick to a slotting die, but it can be used with metal or other blanks as thin as 0.015 in. or less in thickness. The feed is used on a Niagara press of the tilting type, running normally at 100 revolutions per minute.

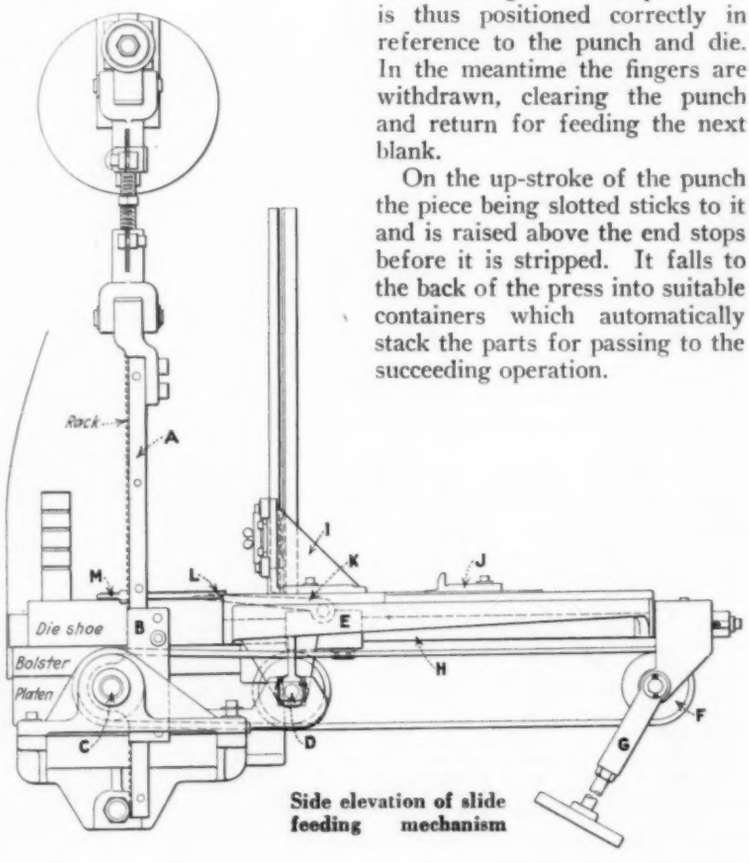
Actuation of the feed is by a reciprocating rack *A*, connected by adjustable links to a crank attached to the end of the crankshaft. At its lower end the rack slides through the guide *B*, which is pivoted to oscillate about the shaft *C* to which the pinion engaging with the rack is keyed. This shaft also carries a sprocket, driving by roller chain to a second sprocket on shaft *D*. Near the other end of shaft *D* is a third sprocket arranged below the reciprocating slide *E*. A chain, running over the last mentioned sprocket, drives a fourth sprocket *F* supported in the yoke *G* which is threaded on the upper end of a rod arranged as a steady-rest reaching to the floor.

As the rack *A* reciprocates, the pinion with which it engages is rotated first in one direction and then in the reverse direction, imparting a similar motion to all the sprockets, and a reciprocating motion to the chain links between sprockets. To one of these links is attached the slide *E*, which thereby is caused to reciprocate on the bar *H* of oblong section. This bar is supported in the framework attached by suitable brackets to the bolster of the press. The framework also forms a bed upon which the blanks to be fed are stacked. Since the bed is parallel to that of the press, which is tilted, the edges of the blanks rest against the angle iron supports held at right-angles to the bed by the cast bracket *I*. The back edge of the blanks are positioned by the adjustable stop *J*.

Pivoted loosely to the reciprocating slide *E* is a pair of fingers *K*, held by a light spring against the under side of the stock to be fed. Connecting the two fingers is a narrow plate *L* a few thousandths of an inch thinner than the blanks. This plate is flush with the upper face of the fingers, which are slightly inclined in reference to the bed. The plate itself forms the edge of a step near the ends of the fingers and, its lower face being in contact with the step, the depth of which is exactly equal to the thickness of the plate.

As the fingers reciprocate with the slide *E*, their upper surface and that of the plate slide under the stock. At the end of their backward motion the fingers reach a position such that the edge of the step clears the edge of the blank, and the spring lifts the ends of the fingers so that the step is in contact with the lower surface of the blank and the edge of the plate engages the edge of the blank. As the fingers move forward, the bottom blank is carried forward and slid from under the pile. A gate on the forward side of the bracket *I* is adjusted so as to prevent more than one of the blanks from being carried forward by the friction of the bottom blank. After it is free from the bottom of the pile the blank is guided transversely by side stops *M*, and slides under the influence of its own momentum and of gravity against end stops formed integral with stops *M*. It is thus positioned correctly in reference to the punch and die. In the meantime the fingers are withdrawn, clearing the punch and return for feeding the next blank.

On the up-stroke of the punch the piece being slotted sticks to it and is raised above the end stops before it is stripped. It falls to the back of the press into suitable containers which automatically stack the parts for passing to the succeeding operation.



Side elevation of slide feeding mechanism

EDITORIALS

February 4, 1932

K. H. CONDIT • F. H. COLVIN
Editors

The Increase in Options

Perhaps the outstanding feature of the 1932 offerings of motor car manufacturers is the increase in options made to attract reluctant consumer buying. The gradual shift toward stream line design is merely accentuated in the new models, but the greatly increased options and pastel color combinations amount to something in the nature of a revolution in the industry. The effects will not be restricted to the assembly plants alone; they will result in increased pressure upon suppliers of automotive materials.

It is estimated in one company that, taking all combinations into consideration, it would be possible to manufacture some forty million different cars. While there is little likelihood of this actually taking place it does indicate the difficulties in making and distributing the new cars. The dealer cannot possibly stock all of the different major color combinations offered, nor can he estimate the direction the tastes of his customers will take. If this is impossible for the dealer, it is equally so for the automobile manufacturer. The net result must be that the cars will, in the finishing stages at least, have to be assembled as the result of expressed consumer preferences.

While suppliers of automotive materials have in the past been under the necessity of giving quick deliveries, this requirement will become more stringent. Gone forever doubtless is the Model-T sameness and assurance. In its place must come a system of flexibility which places the time element in deliveries in the place of paramount importance; not, however, to the neglect of quality.

Suppliers must increase the tempo of their factories; equipment must be introduced to make this possible; materials, such as steel, must be carried part way in the fabricating process awaiting the firm orders from automobile plants for the finishing processes. This need not necessarily increase the cost of doing business. It will mean an increase in the speed of doing business, but inventories will be in a liquid condition, and changes in design will not be hindered by a sluggish stock condition.

Nor will the operating organizations of automotive companies escape the effects of these changes. With an increase of fifty-two per cent in the number of parts used in 1932 models as compared with 1931, as reported by one company, an increase in the operating and overhead forces will be necessary. More careful supervision and greater intelligence on the part of the workers will be required, especially in stock selection and the matching. In one company daylighting equipment had to be introduced to enable assemblers to match properly colors of the various parts going into the final assembly.

It is estimated that this increase in parts and color combinations will result in a decrease in plant capacity of approximately twenty-five per cent. The effect this will have on the industry is likely to be far-reaching. Doubtless it will tend, in some respects, at least, to mitigate the effect the present tariff laws have in forcing automotive manufacturers to establish branch plants in Canada. It will not of course lessen the tendency to do so, nor its economic desirability, but the effect on employment in this country as a result of increased complication in the fabrication of automobiles is likely to be much less marked.

Selling Machines in New Fields

Those who think of machines as being used only in the building of other machinery fail to realize the part they play in all our industries. Information received from dealers in machine tools shows that comparatively few of the recent sales have

been to machine shops as we generally know them. In fact they say frankly that few of their men now call on concerns which would be considered regular customers in normal times.

Instead they hunt up the unusual plant, whether it packs oranges, mixes concrete or builds a new dam. The Boulder Canyon project, for example has ordered several lathes and other machine tool equipment for a little shop that will maintain the various kinds of machinery used on the job. New machine equipment found in such out-of-the-ordinary shops would indicate that still other new fields may be found for standard tools of various kinds and classes.

Economy in Educational Munition Orders

An aspect of the educational munition order that has not had its share of attention is the economy that lies in placing such orders today. A little money expended in educating plants that would have to be called on in an emergency goes as far as many times that amount spent after the emergency arises. Everyone in the metal-working industry knows how expensive of time and money a tooling-up job is when done under pressure. Saving the major portion of that expenditure would, therefore, be a real economy. Even governmental economy may be found to be in fashion this year.

• CHIPS •

Though Japan's military enthusiasm might have been cooled by trade losses, the Japanese navy has evidently not been informed . . . Admiral Shiosawa alternates ultimatums with bombs . . . places Japanese Cabinet in ticklish position . . . Whole situation difficult to unravel . . . Will be best to leave it in the hands of those having authentic news . . . At least the Sino-Japanese affairs have booted the depression off the front pages of the newspapers and given us a chance at recovery . . . Bank of France renews its $25,000,000 share of last summer's $100,000,000 loan to Germany, for one month only . . . Meanwhile the German Ambassador to France tells Laval that his country wants no extension of the Hoover moratorium . . . Will some bright pupil stand up and tell us what Germany really does want? . . . Sweden doubles import duties on foreign automobiles and parts . . . France extends quota import method to U. S. electric motors, generators and other industrial apparatus . . . just another chivalrous gesture from our ex-ally . . . Delegates from 64 countries assemble for Geneva Disarmament Conference.

Babson, who forecast the break in 1929, announces that "the depression is in retreat" . . . Both Dun's and Bradstreet's report the continuance of better feeling throughout the country . . . and gains in employment . . . Much doubt being cast on wisdom of Glass banking bill at this time . . . Many leaders would wait for calmer consideration . . . Directorate of Reconstruction Finance Corporation now complete . . . had lunch with the President and are presumably, ready to get to work . . . May be some time at that before National Credit Corporation can turn its work over to Reconstruction Finance ditto . . . Fairly definitely assured that the new income tax schedules will not be retroactive to 1931 . . . But all sorts of wild taxation schemes are getting an airing . . . President Hoover urges the Congress to "buy in America" . . . Though the Vinson $616,000,000 naval bill has been shelved indefinitely, the Chinese situation brings demands for reconsideration of the strict economy previously wished on the Army and the Navy . . . Rail labor wage reduction of 10 per cent settled at last . . . affects 1,500,000 men . . . Will save railroads $200,000,000 per annum for the year at least.

A certain machine tool builder negotiated the sale of several new toolroom millers to a prominent motor car manufacturer. A like number of old millers were to be taken in trade. The new were delivered. The buyer refused to return the old—said he was too busy to give them up. "All right," said the builder. "What do you think of buying some more new millers? We'll still consider the old ones in trade." And the dicker is still in process.

Does he or doesn't he expect to build up an endless chain? Will the old millers be entirely worn out before he finally gets them back?

Southern Pacific purchases Cotton Belt and becomes longest railroad in the United States . . . Rolls-Royce of America, Inc., files answer to receivership proceedings . . . claims good cash position and complete solvency . . . Gar Wood and Miss America IX set motor boat speed mark of 110.785 miles per hour . . . Samuel Crowther announces five billion dollar load fund to be launched by group of leading industrialists . . .

no details—sounds suspiciously like the "Du Brul plan" . . . if so, all to the good . . . Du Pont ready for the market with a synthetic rubber to be known as DuPrene . . . Magnavox Company, Ltd., and subsidiaries move offices from Chicago to Ft. Wayne, Ind., thus consolidating production, engineering, purchasing and sales in one location.

When most of us learned the chronological tables, they began thus:

60 seconds = 1 minute
60 minutes = 1 hour

Meanwhile we have acquired electric clocks, and A. J. Schwartz suggests a revision:

60 cycles = 1 second
60 seconds = 1 minute

and so on as long as tempus is able to fugit.

News from all the various automobile shows continues encouraging . . . likewise the Motor Boat Show with retail sales considerably over last year . . . One large boat builder reports all 1931 models sold out . . . will start fresh on 1932 . . . Floor purchases at Buffalo automobile show run 50 per cent ahead of 1931 . . . N. Y. show sales for Packard 600 per cent over last year . . . Not so strange that Detroit employment ratio stands at 67.2 per cent, against 64 in December and 41.7 in October 1931 . . . Fostoria Pressed Steel 1931 profits ran almost 25 per cent above those of 1930 . . . RCA Photophone increased its business 200 per cent in 1931 over the previous year . . . New $10,000,000 strip mill goes into operation at Inland Steel . . . will offer work to 375 men . . . American Aluminum Company plant at Alcoa is working on 500,000-lb. sheet aluminum order for Ford Motor . . . Westinghouse Electric Elevator Company awarded 74 elevators in Radio City . . . Otis Elevator awarded 26 . . . Some of these elevators will run at speed of 1,200 ft. per min. . . . McQuay-Norris Mfg. Company estimates 1931 profits at $472,000 against $469,616 in 1930 . . . Crosley Radio reports net of $21,166 in last nine months of 1931 against loss of $445,958 during same 1930 period . . . Steel ingot production continues its recent rise . . . Rock Island returns 1,700 men to its shops . . . Mullins Mfg. Company earned $100,094 net in 1931 vs. net loss of $333,713 in 1930 . . . National Acme Company reports new orders for the week 25 per cent over recent levels.

THIS WEEK IN *AM*

Jonathan T. Lincoln, the author of "The Invention of the Slide Lathe" (page 168), is engaged in collecting source material relating to the history of machine building in the United States, for preservation in the Baker Library at Harvard, and is writing a History of American Textile Machinery. From 1892 until 1926, he was connected with Kilburn, Lincoln & Company, builders of textile machinery, serving the firm successively as foreman of machine shop, works manager, treasurer and president. Meanwhile he was a director in numerous cotton textile corporations and lectured at Dartmouth on the problems of labor. He holds an A.B. degree from Harvard and an honorary A.M. from Dartmouth.

The author of "A Large Compound Die for Refrigerator Legs" (page 172), C. W. Hinman, is one of our most welcome contributors. He is a product of Iowa State and Armour Institute. His experience covers a wide range, he having been one of the first tool designers at Western Electric Company, head of tool design at Automatic Electric Company, tool engineer of Addressograph Company, etc. It has been said that he was instrumental in building up the dial telephone to world recognition. His first contribution to *American Machinist* was published in 1906. For the past three years he has been, and still is, chief tool designer for the Kobzy Tool Company.

• COMING •

When automobile builders look back at the old days of two or three models and one standard color, they must be tempted to heave a mighty and heartfelt sigh. One diligent mathematician has even taken time off to estimate that if all the color options were exercised in just one well-known line of automobiles, several million cars would be required to carry them all. The man who schedules production has no sinecure; yet, when you read the leading article in next week's issue, you will see how he has licked his job in one important automobile plant.

Though we can never guarantee the contents of a future issue, next week's issue will almost certainly contain: a list of recommendations for applying gearing; an article which will give the low-down on how one man become a floater; the second installment on the art of swaging; how to make fine caliper measurements; two pages of unusual milling operations; and the latest developments on the Temple gun. If you recall "Gunpowder Deserts Mars for Vulcan," you will look forward to these new data.

Progress in Metal-Working and Machinery Markets

AUTOMOTIVE, principally Ford, and governmental, largely Federal, inquiries and orders are the principal relief in an otherwise slow situation . . . Makers and dealers are more cheerful than they have been, predicated on the hope that the Spring will bring a general upturn . . . Most tool sellers expect February to be better than January, which in turn will be, in most cases, better than December . . . Auto shows, Reconstruction Finance Corp. and the Sino-Japanese situation are all considered major factors in possible spring developments.

NEW YORK dealers feel better; some have better Januaries . . . Pacific Northwest, at the other side of the continent, notices slow improvement, principally in automotive machine tools, wood-working equipment, and units ordered by the Federal Government . . . Cincinnati tells of a lathe manufacturer who has increased his working forces considerably as a result of orders, the largest from a shipbuilder . . . Ford's series of orders among builders have also helped . . . Cincinnati inquiries are looking up . . . New England reports a materially bettered situation, evidenced in sentiment, inquiries, and new prospects . . . Orders, however, held the same level, though Chrysler and other automotive companies are expected to buy tools shortly.

DETROIT, closest to auto builders, nevertheless feels furthest from business . . . Even there, however, optimism is general . . . Chicago, contrary to expectations, is holding the December level, with even inquiries scarce . . . Indianapolis shares this opinion, though a fair amount of small tools is going to automotive accessory, radio cabinet, and furniture builders . . . Canada reports a better outlook, improving tool sales, and stepping up of industrial production to justify more purchases shortly.

PACIFIC NORTHWEST

Market conditions are improving slowly; sentiment is more optimistic. Although 1932 has made a poor start, indications favor a decided upturn during the spring months and all branches of the business are extremely hopeful. Federal requirements furnish the bulk of present business, and more is coming. State and municipal projects are handicapped by inability to float bond issues. Lack of financial support is also handicapping industrial inquiry. There is some improvement in demand for automotive machine tools. The woodworking branch is more promising. The lumber industry is operating only at 22 per cent of capacity, there is more activity in logging and some equipment has been sold to that industry. Mining continues to lag. Gold properties are generally unable to obtain money to purchase tools and equipment. Highway construction continues active but many contractors are renting machinery instead of purchasing. The canning industry is dormant.

NEW YORK

Feeling is a little better; some dealers will have a January better than December to substantiate it. Said one, "January will be better, but still is nothing to go crazy over." In at least one case, however, January was a very poor month, poorer even than it was expected to be. Several dealers noted improvement in prospects, one or two closed more sales the past weak. Orders are small, for single units, almost entirely for replacement.

CINCINNATI

A manufacturer of lathes received enough business to require considerable increase in the working force, one order being from a shipbuilding company and others being from various classes of users. Other manufacturers and also local selling agents note no change in the demand. A fair number of inquires were received. One large manufacturer stated that things looked better and that he fells encouraged. A number of manufacturers are of the opinion that the recent governmental steps to relieve the financial situation will gradually bring about a psychological reaction that will assist in restoring confidence.

NEW ENGLAND

The whole situation seemed materially better during the week; sentiment was much improved; inquiries were in better volume; and new prospects included an unexpected sprinkling of companies not in the market for many months past. Orders, however, were at approximately the same level, with the usual predominence of single units. It will be some time before increased schedules will be necessary in machine tool centers. Chrysler is interested in New England built grinders. In fact the automotive industry gave this territory most of its January business, and promises increased business for machine tool builders as compared with 1931.

DETROIT

Sales and inquiries are more scarce than at any time in many years. Machinery and machine tool men are at a standstill, at a loss even to know where to call. In spite of the dearth of business, morale is fairly high. Dealers and salesmen seem convinced the automobile industry will revive sufficiently to bring about a significant increase in equipment purchases.

CHICAGO

The machine tool market situation is without change, according to reports from various sources. The hope, if not the expectation, that evidences tending to the belief that an upward trend was on the way apparently is not as strong as it has been. Inquiries still are scarce, those indicating a possible closing at an early date being actively followed up without opportunity being given prospective buyers to grow lukewarm. Not in years have sales forces been so untiringly and persistently kept on the move, no chance of a sale being overlooked because of slackness. Small tools still are in fair demand, but requests for quotations on units running into big figures are conspicuous by their absence. The consensus of opinion is to the effect that, while an upturn is not imminent, there are signs that improved conditions of a certainty will prevail before the advent of spring.

INDIANAPOLIS

The local machinery and machine tool trade continues hopeful in face of scarce orders. Leaders in the trade are watching with some considerable speculation for the first signs that the financial rehabilitation program passed by Congress is beginning to work. Just what can be expected from the automobile trade is a matter of conjecture as yet. A fair amount of small tools is being sold. Most go to the automobile accessory trade, though some few items of special equipment are being bought by the radio cabinet and the furniture trade. Credit conditions seem slightly better.

CANADA

The outlook for machinery and machine tools continues to improve. There are more serious inquiries, and a considerable number of them are being converted into orders. Increased schedules on which some iron and steel plants are beginning to operate are encouraging. Improvement promised by recent railroad orders and the prospect of renewed demand from motor car factories is emphasized, compared to last year's diminished output. Agricultural implement makers give evidence of renewed vigor, and sales of household electrical appliances are holding up well. Pipe foundries are in active operation.

WEEK BY WEEK

The Business Barometer

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

A RECENTLY published book, "Only Yesterday," written by Frederick Lewis Allen, is an entertaining discussion of the post-war period and the many novelties with which society has become acquainted since the Armistice. One chapter deals with the experiences of a mythical Mr. and Mrs. Smith in 1919, and says that up to that time they had never heard of Coué, the Dayton Trial, cross-word puzzles, bathing-beauty contests, John J. Rascob, racketeers, Teapot Dome, Coral Gables, *The American Mercury*, Sacco and Vanzetti, companionate marriage, the Wall Street explosion, confession magazines, the Hall-Mills case, Radio stock, speakeasies, Al Capone, automatic traffic lights, or Charles A. Lindbergh. This semi-humorous statement serves to emphasize the constant emergence of new facts by which the progress of humanity is helped or hindered.

We of the present generation may think that we live in the most important period of the world's history, and that the occurrences of the last fourteen years will profoundly affect the future of humanity. This is possible, but it is a theory upon which Mr. Allen casts some doubt by calling attention to the complete obliteration of many issues that were regarded as fundamental a few years ago.

Just at present Europe and America are greatly agitated over the economic predicament in which those who participated in the World War now find themselves. The difficulties arising out of the situation seem to be very grave, but we are always disposed to exaggerate our present troubles, although it is questionable whether their seriousness exceeds that of other troublesome eras.

Big Things in a Big Way

During the war we became accustomed to "big things done in a big way," and it is the size rather than the novelty of the economic structure that has come into being by which we are sometimes dazed. This is particularly true of the financial program to which Mr. Hoover and Congress have subscribed. The passage of the bill bringing the Reconstruction Finance Corporation into existence is probably without precedent in peace-time use of Government money.

Some Englishman has said that the banking assets of the United States are being solidified by the passion for liquidity that seems to have obsessed our bankers, and Ogden L. Mills, Under-Secretary of the Treasury, maintains that the banks have been destroying their deposits by compelling liquidation. He protests against this policy, and the credit that will now be put at the disposal of the banks who need and are entitled to it should arrest the contraction that has been in progress ever since last summer. Some there are who fear that the result will be inflation, but others say that the progress can be so controlled that its only effect will be to check deflation. This seems to be a distinction without much of a difference, and everyone is waiting to see the Reconstruction Corporation get into action and relieve the strain under which many banks have been laboring.

Reassurance

The commodity markets as well as the stock market have reflected the relaxation that became noticeable as Congress acted in dealing with the reassuring legislation that has been adopted or is being considered. This legislation involves the use of fully three or four billions of dollars, but the Treasury will soon be put in a strong position, and the money will be available when needed.

Earlier in the week the stock market seemed quite cheerful, but it eased away somewhat upon the action of the steel directors in reducing the quarterly dividend to fifty cents a share. The book value of the stock is said to be over $200 a share, cash dividends during the past 15 years amounted to $115 per share, in addition to a stock dividend of 40 per cent, and when earnings justify it, the corporation no doubt will again pay liberal dividends.

The liquidation of speculative securities has, however, been so complete that prices are probably at or near the irreducible minimum. Upon this theory stocks are being picked up by shrewd investors from day to day. Buyers are, however, paying cash, and brokers who were borrowing tens of millions three years age now owe little or nothing.

The railroad labor unions are reliably reported to have agreed to a 10 per cent reduction in wages for one year, with the stipulation that the roads must wait one year after the present agreement shall terminate before making any further overtures for reduction. While this would mean a saving to the carriers of approximately $200,000,000, their acceptance or rejection of the compromise will be influenced by their views as to the prospects of business a year hence and by their undoubted desire to avoid long-drawn-out proceedings necessary to force a reduction.

The Federal Reserve Bank of Chicago reports that business is distinctly better in the Middle West, and more cheerful advices are being received from many other sources.

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THE BUSINESS WEEK

February 3, 1932

No indications of general increase or decrease in business activity are apparent in the week-to-week records since the beginning of the year . . . Steel production has shown about the usual seasonal rise under stimulus of increasing automobile production, but steel demand from other sources continues slack . . . Carloadings and electric power output have not improved . . . Construction is being further curtailed by public economy waves which are increasing unemployment . . . On the whole, evidence that December or January may have marked the turning point is still uncertain . . . Securities markets are still listless, facing unfavorable earnings reports and lacking evidence of early business improvement . . . Commodity prices show no sustained strength . . . Attention is now centered on credit factors, and business hopes turn on the effective operation of the Reconstruction Corporation . . . After two years of delay the folly of deflation is now officially recognized and efforts to stimulate credit expansion are under way . . . But the problem of inducing expansion through ordinary banking channels has become more complicated and difficult . . . Foreign interference is one obstacle, difficulty in securing domestic commercial banking cooperation another . . . It is becoming clearer, in any case, that mere maintenance or mild inflation of security prices cannot in itself assure increased employment, resumed buying and business recovery . . . No inflationary effort can be effective in these respects which does not directly affect commodity prices, particularly raw materials and farm products . . . For this purpose direct currency expansion in consumption channels appears to an increasing number of people a necessary supplement to credit expansion to support security values, and congressional discussion is turning in this direction.

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MATERIAL TRENDS AND PRICES

Buying of steel sheets, strips and tin plate is noticeably active as compared with demand for the heavy-rolled products such as, shapes, plates and bars. Mill operations for the industry as a whole, were at 29 per cent of capacity in the last week of January, as compared with 20 per cent, at the close of December and 46 per cent, a year ago. The increased rate applies to filling of old orders and does not indicate a marked upturn in the trade. Steel prices are steady. Tin is higher at New York, while scrap brass and copper tend upward in Western cities. The principal decline of the week in the accompanying list, occurred in slab-zinc at East St. Louis.

(All prices as of Jan. 29, 1932)

IRON AND STEEL

	Current	Mo. Ago	Yr. Ago
Pig Iron —			
Birmingham, No. 2, Fdry., per gross ton	$10.00@$12.00	$11.00	$13.00
Buffalo, No. 2, Fdry., per gross ton	15.00@ 16.00	15.00	17.50
Heavy Melting Steel Scrap —			
Pittsburgh consuming point, No. 1, per gross ton	10.00	10.00	13.00
Furnace Coke — Connellsville, per net ton	2.25	2.25	2.40
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.25
Steel Shapes — Pittsburgh, base, per 100 lb	1.50	1.50	1.65

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Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.

Chicago....4.62½	Cleveland....4.50	New York....4.75
Cincinnati....4.35	Detroit....4.00	

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Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Hot rolled, No. 10	1.85	3.20	3.00	3.00
Hot-rolled, No. 24	2.40	3.55	3.25	3.50
Galvanized, No. 24	2.90	4.10	3.75	4.00

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Seamless Steel Tubing — Cold drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches					
		⅛	¼	⅜	1	1¼	1½
Inches	B.w.g.	Price per Foot					
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23 00
15 to 18%	20.50	23 to 30%	28 00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham Chicago, Cleveland and Pittsburgh, on bolts (except tire and stove) nuts, and lag screws, mill lots....73–10–10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots 99%, N. Y	23.30
Copper, electrolytic, Conn	7.50
Copper wire, base, Chicago and Cleveland	9.62½
Copper wire, base, N. Y	9.50
Lead, pigs, E. St. Louis	3.55
Tin, Straits, pigs, spot, N. Y	22.25
Zinc, slabs, E. St. Louis	2.90
Prices following are in cents per lb., base, N Y., Chi. and Cleve.:	
Brass rods, high	11.12½
Brass sheets, high	13.37½
Brass tubing, high	16.62½
Copper, drawn round	14.12½
Copper sheets	16 62½
Copper tubing	16.12½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.25
Babbitt, genuine, highest grade	43.00
Solder, bar	17.25
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.75	2.75	2.75
Light brass	2.25	1.50	2.37½
No. 1 rod-brass turnings	3.00	3.00	2.50
Heavy copper	5.25	4.50	4.12½
Light copper	4.25	3.75	3.62½

SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	30–10%	40%	40%
Belting, rubber, trans., Grade 1	60–10–10%	60–10%	60%

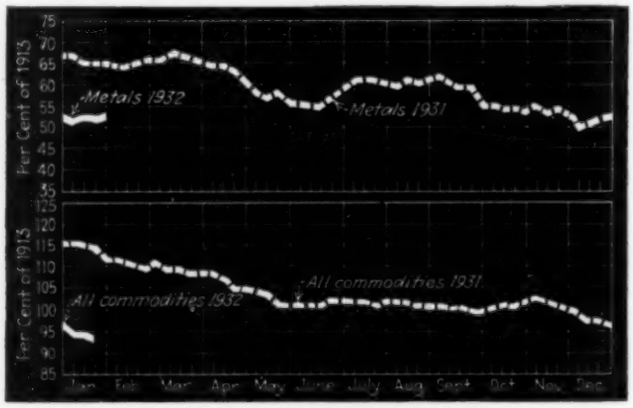
Lumber — Per M ft., b.m., 12-16 ft. lengths, delivered, N. Y.:

Crating — Southern pine:

1x4-in. $27.00 1x6-in. $26.00

Skids—Spruce:

2x4-in. $35.00 3x4-in. $35.00 4x6-in. $37.00 6x6-in. $50 00


Per Cent of 1913
Metals 1932
Metals 1931
All commodities 1931
All commodities 1932
Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec

Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

Bogdanov Blames Tariff for Soviet-American Trade Drop

Speaking before American-Russian Chamber, he assails lack of credits, higher prices, import restrictions for decline—Col. Hugh Cooper stresses vital importance of Soviet market

PETER A. BOGDANOV discussed "Economic Development and Foreign Trade of the U.S.S.R." at a luncheon of the American-Russian Chamber of Commerce at the Bankers Club, New York, Jan. 28. Mr. Bogdanov discussed the plan of trade relations between the Soviet Union and the United States and stressed the point that these were not due to the general depression but rather to "obstacles which have been placed in the way of Soviet imports into this country." Difficulties encountered by Soviet exporters apply principally to such American imports as pulp, wood, asbestos, matches and similar products, which Mr. Bogdanov claims do not compete with American commodities. Said he, "The manner in which obstacles are arbitrarily imposed—even though in some cases they are subsequently removed—creates an uncertainty and an insecurity which prevent business-like arrangements. I do not wish to discuss here the many troublesome devices which have compelled Soviet exports to seek other markets, with a consequent reduction of Soviet purchases in the United States. But it is obvious that such obstacles create a condition entirely unusual and disadvantageous for the development of trade, and this policy has created a most unfavorable impression upon Soviet exporting organizations. The practical results have been shown in the sharp decrease of Soviet-American trade in the past year.

"Some people have the erroneous impression that, regardless of any restrictions placed upon Soviet trade, the Soviet Union must continue to purchase American goods and that it will find ways to pay for these purchases by money obtained for Soviet exports to other countries. Apart from the basic fallacy of this contention, there is a special factor which makes it utterly invalid. As you well know, many countries have placed severe restrictions upon transferring funds abroad to pay for imports. Under these circumstances, it would be unwise for the Soviet Union to undertake obligations in the United States based on the assumption of paying them with money obtained from exports to other markets. American business men themselves, I think, should be the last to urge us to undertake the development of triangular trade when one leg of the triangle is missing.

"The decline in Soviet purchases in the United States during 1931 was not due to the world depression. It was not due to any financial weakness in the Soviet Union. It was caused primarily by the conditions for the importation of Soviet goods into the United States.

"Furthermore, Soviet-American trade was hampered by the fact that commercial terms offered by American firms were less advantageous than those offered in other countries. Naturally, the Soviet Union prefers to buy wherever it can obtain better prices and better credits.

"The Soviet Union continues to offer a market to the world's exporters. It aims to increase its trade relations with all other countries. It is not only a great potential market. It is rapidly becoming one of the greatest actual markets in the world. There is no valid reason why American manufacturers should not have a large share in this market. Resumption and expansion of Soviet-American trade requires only a reasonable attitude towards Soviet exports to the United States and favorable commercial terms.

Every Bill Paid

COL. HUGH L. COOPER, president of the Chamber, spoke on "American-Russian Trade During 1931 and Its Future Possibilities for the United States" at the luncheon. Said he, "In 1928, Soviet Russia was eighteenth on the list of our foreign customers. In 1930 it had moved up to our sixth best customer. It was the only large country to increase its business with us that year and American manufacturers sold to Soviet purchasers nearly $150,000,000 in goods. In six years we have sent over half a billion dollars of our products to Soviet Russia, and every bill, without exception, has been paid in full when due. In these days this is something to think about. Now we are losing this trade to business rivals in other countries. It is slipping away from us very fast indeed. This fact should give us something to think about also."

Reasons why shrewd trade competitors in other countries are able to take the market away from American exporters, according to Mr. Cooper, are that credit facilities available in Europe are lacking here, and the American compaign against limited imports. Said Mr. Cooper, "It has been thoroughly demonstrated that loans or credit must be made for productive purposes, if we are to expect their repayment. I do not know of a country today having a plan of national productive development that offers more mutually sound beneficial possibilities for the foreign trade of the United States than does the Five-Year Plan and the succeeding Five-Year Plans.

"The Soviets are now busily engaged in drawing up a second Five-Year Plan. In preparing their plan the Soviets must take into consideration the purchases they will be required to make in the outside world, and the distribution of such purchases among the various countries. The Soviets in determining the answer to the question, 'Shall we follow American ideas or European ideas in developing our country?,' will necessarily have to consider the relative status of their trade relations with the United States and with Europe.

"I am certain that the Russians, from the heads of the government down to the factory workers, prefer American products. Stalin has told me personally of this preference. But Soviet purchases must be financed the same as any other purchases, and this can only be done by the establishment of proper credit facilities, and it is in this particular that we are now at a disadvantage."

Average annual figures for trade between Russia and the United States for the years 1910 to 1914 were as follows: Exports from the United States to Russia $24,604,000; imports from Russia to the United States $20,865,000; balance in favor of the United States $3,739,000

SOVIET-AMERICAN TRADE FROM 1923-24 TO 1931
(In thousand dollars)

Soviet Fiscal Years (Beginning Oct. 1)	Purchases	Sales	Balance in Favor of United States
1923–24	43,916	6,845	37,071
1924–25	86,938	15,408	71,530
1925–26	48,560	24,148	24,412
1926–27	71,689	21,094	50,595
1927–28	91,232	22,307	68,925
1928–29	107,651	30,749	76,902
1929–30	149,223	31,017	118,206
Oct.-Dec., 1930	14,423	6,166	8,257
1931 (calendar year)	51,232	18,595	32,637
TOTAL	664,864	176,329	488,535

30,000 r.p.m. by air—grinding with the new Madison-Kipp grinder

Russia Progresses, Buying Tools Where Credits Are Longest

By Our Berlin Correspondent

Several Austrian firms have lately received large new orders from Russia, particularly for automobiles, ship's engines, drilling machines, drills, and other machine tools and tools. Russian orders placed with firms in Germany lately include: Cranes in Westphalia, Berlin and Northern Germany, for "Metalloimport," to the value of $1,075,000, forges in Central Germany, for "Uralmaschinostroj," value $100,000. Equipment for a sand preparing plant of 35,500 tons annual capacity, in Central Germany, worth $95,000, horizontal drilling and milling machines, vertical lathes, tire rolling and horizontal boring machines in Berlin, for the "Womt" and "Parwagdis," to the value of $600,000. Measuring and cutting tools in Berlin, value $225,000, grinding and surface milling machines in Berlin, for "Stankoimport," worth over $225,000, turret lathes in Western Germany, for "Womt" and "Stal" for $400,000, universal milling machines in Saxony, for "Ssojusselmasch," to the value of $180,000, trimming and punching presses in Central Germany, for $120,000, for "Stankoimport," power presses in Western Germany and Wurttemberg, worth $120,000.

Further Buying in Germany

Here and there rumors have arisen that the Soviet is not keeping up dumping in a number of markets, thus is obliged to increase prices, leading to a reduction in the export possibilities of Russian goods. Russia meets her engagements in foreign countries with the proceeds of her export goods, and she has thus seen herself obliged to decrease her buying activity for the time being. Only financially strong German concerns are able to secure Russian orders, those who are in a position to grant the required long-time credits, up to 28 months and even longer. Some special lines, though, are ordered as before and are paid for within reasonable periods. In this connection mention should be made of several Russian special commissions staying in Germany at present. The main item is the extension of the Russian railroad system, which represents the object of negotiations between one of these commissions and German firms. Besides other materials, coaches and equipment for railroad shops are kept in mind. A further commission is to make negotiations with German firms for the purchase of locomotives, while another will take up the question of purchasing ships from Germany.

Reports from Charkow state that the first super locomotive of the giant type 1-5-1 has been completed at the "Oktjabrskaja Revoluzia" plant. Construction of this locomotive was effected within 70 days, a period shorter than that normally required by American firms for similar types.

In the Leningrad "Putilow" works, turbine construction has been taken up as a new branch of manufacture, and turbines can now be delivered within a short period.

Control ciphers for three years of the new Moscow Cycle works demonstrate the rapid development of this branch of manufacture. In the year 1932 the plant is to produce 50,000 cycles to the value of $4,900,000, in 1933, 300,000 cycles worth $25,000,000, and this production is to rise to 450,000 cycles in 1934 with a value of $44,000,000.

Electro-magnetic separators are being produced in the machine plant at the "Leninmech" trust, capable of magnetically liberating compound metals from all composite substances. These electromagnetic separators also enable quick sorting of scrap metal in the works.

Industrial Research Progresses

The U.S.S.R. is establishing industrial research institutes to an increasing extent. There were only 24 such institutes, with 8 branches, in the Soviet Union in 1928, but up to 1931 this number had been increased to 120 institutes, with 76 branches. The total number of assistants employed is about 24,000. The means granted to these institutes in 1931 alone amount to some $7,200,000. Results achieved by them, under cooperation with foreign experts (Americans and Germans) are in some instances notable. Thus, for instance, the institute for civil aviation recently completed a giant airplane, to carry 42 persons, and also, for test purposes, an all-steel plane electrically welded, with good results.

Machine Construction

During late months Russian machine construction in particular experienced great success. The output of steam boilers rose by 67.1 per cent, compared to the first ten months of 1930, that of steam turbines by 140.3 per cent in hp., the production of hydraulic turbines by 63.7 per cent in number, of electric power turbines by 38.6 per cent, of turbo-generators by 71.5 per cent. Further increases, comparing the months of October, 1930 and 1931, are recorded by the association for boiler and turbine construction of 48.9 per cent, by the association for locomotive building of 31.4 per cent, by the association of machine tool factories by 76.8 per cent, and by the associated textile works by 81.8 per cent.

The plan to erect an enormous new plant for the production of electric machinery in the Ural, as the new center of the heavy industry, has as its motive the necessity to organize a mass production of electric machines in a new industrial and mining district, under the almost exclusive employment of raw materials supplied by the surrounding coal and mining area. After several fundamental alterations definite plans are now ready for a combined group of plants, all erected at the same place and intended to supplement each other. Such a group of several works in the same place, is named a "Kombinat" in the U.S.S.R. The draft of the Ural electric machinery plant (Kombinat) provides for the erection of five basic plants with an annual production of $1,000,000,000 (prices of 1926-27). Contrary to existing plants and Kombinats, whose electro-technical production is of a universal character, the Ural Kombinat is to concentrate on the production of modern super-power installations. The following fundamental plants will effect this production:

1. Turbo-generator plant. Is to attain a yearly production of 38 large and super-steam generators, each of 50-160 kw. and more.

2. The machine construction shop will chiefly build heavy machines, among them modern electric machinery equipment for the mining and heavy industries (rolling mill motors, cam motors, etc.), and hydro-generators up to their maximum capacity (100,000 kw.). Besides, the plant will supply standard machines, chiefly for d.c. as well as a variety of machine motors.

3. The transformer works will take care of the construction of all types of transformers, including super models, for 200,000 volts and higher.

4. An accessory plant will supply power equipment (a large variety of oil switches), motor shunting installations for the industry (crane equipment, automatic fuses, resistances, etc.)

5. The cable works, which will be entrusted with the provision of all types of cables for the other plants of the Kombinat. The plan provides for the manufacturing of cables for maximum voltages, as well as all other improvements in the way of cable production.

In this way, the Kombinat will supply equipment for large power plants, as well as all cables, and will be able to manufacture motors and other equipment to meet the demands of heavy industry.

Assuming its erection to commence immediately, the Kombinat will be able, according to the plan, to attain an output of $15,000,000 in 1933, of $400,000,000 in 1934, of $660,000,000 in 1935, in 1936 of $970,000,000, and of $1,080,000,000 in 1937.

Investments in the Kombinat total $350,000,000, of which 36.5 per cent covers buildings and 63.5 per cent machine equipment. According to latest reports the number of hands employed, after completion of the works, will be in the neighborhood of 85,000. It has also already been decided in which works, industrial schools, etc., and at what times the annually required number of new technical assistants will be trained.

A.S.T.M. Will Meet To Discuss Rubber

The Third Regional Meeting of the American Society for Testing Materials is to be held in Cleveland, March 9, with sessions and a dinner in the Hotel Cleveland. A symposium on rubber is to be held in the morning and afternoon sessions. The meeting is being arranged by the Cleveland district committee of the Society, and the technical program is sponsored by Committee D-11 on Rubber Products.

A particular aim of the program is the dissemination of accurate information concerning rubber and its products to those outside the rubber industry. In the morning, five papers will be given dealing with rubber product manufacture, while those in the afternoon will deal with engineering properties of rubber and point out various applications of rubber products. Papers in the morning session are "The Extent and Diversity of the Rubber Industry," by ARTHUR W. CARPENTER, manager of Testing Laboratories, B. F. Goodrich Co.; "Crude and Reclaimed Rubber," by R. H. GERKE, development department, U. S. Rubber Co.; "Vulcanization," by N. A. SHEPARD, director of chemical research, Firestone Tire & Rubber Co.; "Compounding—A Discussion of the Fillers, Reinforcing Agents and Softeners Used in the Compounding of Rubber," by R. H. SEEDS, development department, Goodyear Tire & Ribber Co.; "Structure of Rubber in Combination with Textiles and Other Materials," by C. H. ZIEME, Technical Superintendent, Republic Rubber Co. Papers at the afternoon session include: "The Flexing of Rubber Products," by E. G. KIMMICH, development department, Goodyear Tire & Rubber Co.; "Shock and Vibration Absorption Properties of Rubber," by R. K. LEE, director of research Chrysler Corp.; "Some Factors Involved in the Destruction of Rubber Products by Wear," by V. A. COSLER, technical superintendent, Hewitt-Gutta Percha Rubber Corp.; "The Chemical Resistance of Rubber as an Engineering Material," by H. E. FRITZ, manager, and J. R. HOOVER, assistant manager, chemical sales division, B. F. Goodrich Co.; "Resistance of Rubber to Water and Gases," by R. H. GERKE, development department, U. S. Rubber Co.; "Electrical Characteristics of Rubber Insulation," by E. W. DAVIS, electrical engineer, Simplex Wire & Cable Co., and "Rubber as an Adhesive in Tape, Cements, Frictions and Metal Bonding," by J. J. ALLEN, chief compounder, and J. E. BOYER, compounder, Mechanical Good Division, Firestone Tire & Rubber Co. An official of Goodyear-Zeppelin Corp. will speak on "Lighter than Air—Ships" at the informal dinner at the closing event of the meetings. Inspection trips will also be arranged to the Goodyear-Zeppelin Dock in Akron, Goodyear plant, Goodrich plant, and Firestone plant.

Standing committees of the A.S.T.M. will hold their Spring Group Committee Meetings in Cleveland, beginning Monday, March 7 and extending through Friday, March 11.

Aircraft Builders Elect Russell as Head

FRANK H. RUSSELL, of Curtiss Aeroplane & Motor Co., Inc., was elected president of the Manufacturers Aircraft Association at its annual meeting in New York. The association grants licenses under the 466 patents owned or controlled by its members, and directors authorized a special committee to study the practicability of a general revision of the cross-license agreement.

Other officers elected were: Vice-presidents, J. DON ALEXANDER, Alexander Industries, Inc; EUGENE E. WILSON, Chance Vought Corp; E. T. ASPLUNDH, Pitcairn Aircraft, Inc.; treasurer, CLAYTON J. BRUKNER, Waco Aircraft Co., secretary, WALTER C. DAVIS, Davis Aircraft Corp., general manager, S. S. BRADLEY.

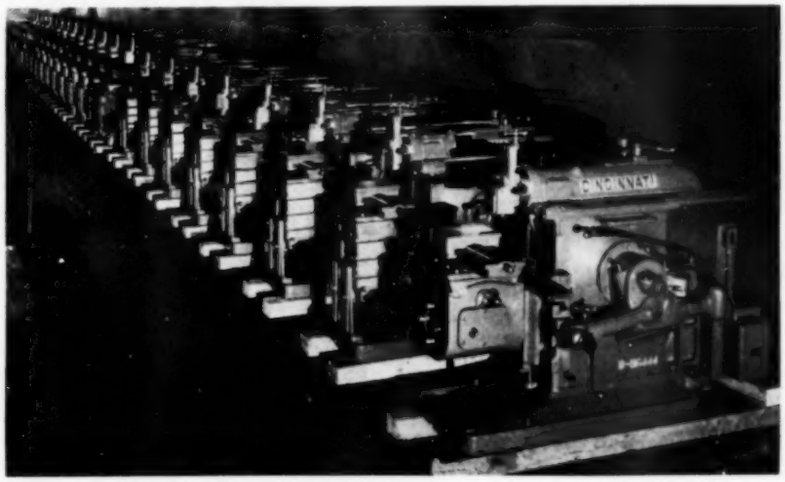
S.A.E. Meeting Breaks Attendance Records

The annual meeting of the Society of Automotive Engineers, was held in Book-Cadillac Hotel, Detroit, Jan. 25 to 29, coincident with the automobile show in Convention Hall. The meeting of the Michigan Automotive Trade Association during the same period marked a week of intensive interest devoted to Michigan's major industry.

Papers read at the meetings of the automotive engineers were received by the largest audiences in the history of the organization; over 1,500 members and guests being registered. Judging from attendance figures, the session devoted to internal combustion engines, attended by 700 students from nearby colleges and universities, and to streamlining and rear-engine mounting, were the high lights of the convention. Papers and reports were also given on front wheel alignment, bearings, the diesel engine, fuel systems and vapor lock, and noise and heat control in automobile bodies. Riding comfort, maintenance and the Army's interest in automotive developments completed the convention.

GORDON LEFEBVRE, consulting engineer, challenged the attention of the Production session by estimating that the investment a concern has in an individual foreman is equivalent to $5,000. As a means of conserving this investment the suggestion was made that increased attention should be given to selection and training. At this session also two films were shown. The first, by Dr. Becker, portrayed the German experiments with vibrations in steering systems; the second dealt with automatic loading of machine tools. MAURICE HOLLAND, National Research Council, who was the principal speaker at the Annual Banquet Thursday evening, advocated cooperation in research on those problems which are common to a number of companies, to avoid duplication and to reduce investigational costs. In the case of patentable discoveries, special processes, and items of similar nature, it was suggested that they be carried out by individual companies.

The following officers were elected for 1932: A. J. SCAIFE, president; and vice-presidents: W. B. STOUT—Representing Aircraft Engineering; C. L. LAWRANCE—Representing Aircraft-Engine Engineering; A. J. POOLE—Representing Diesel-Engine Engineering; B. B. BACHMAN—Representing Motor-Truck and Motorcoach Engineering; D. G. Roos—Representing Passenger-Car Engineering; A. J. NEERKEN—Representing Passenger-Car-Body Engineering; J. E. PADGET—Representing Production Engineering; A. S. MCARTHUR—Representing Transportation and Maintenance Engineering.



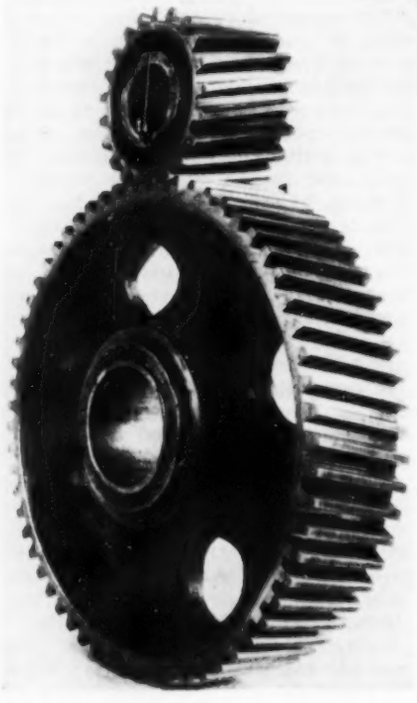
Replacement as is replacement—a single order for 23 shapers shipped to a prominent motor car manufacturer

Metal-Working Machinery Alone Shows 1931 Export Upturn

WASHINGTON, D. C., FEB. 1—Metal-working machinery was the one item on the whole machinery schedule to show a greater value of exports during 1931 than in 1930. Because of lower prices this indicates a larger movement to foreign countries than the figures show. During the calendar year of 1931 power-driven metal-working machinery to the value of $36,027,029 was exported. This compares with $35,489,749 in 1930. The value of other metal-working machinery exported during 1931 was $4,003,072. This compares with $3,861,953 in 1930. Total machinery exports in 1931 were valued at $484,539,022, compared with $830,075,960 in 1930.

In December the exports of power-driven, metal-working machinery were valued at $1,989,786. This is an increase over December, 1930, which was valued at $1,652,752. It shows a decline, however, over the large exports in November when the total reached $2,244,018. The December exports of other metal-working machinery were valued at $388,542, as compared with $198,602 in December of 1930. Detailed figures for exports in this group, as taken from the records of the Bureau of Foreign & Domestic Commerce are:

	December, 1930	December, 1931
Engine lathes	$45,209	$57,643
Turret lathes	17,020	98,170
Other lathes	36,675	51,828
Vertical boring mills and chucking machines	34,485	131,449
Thread-cutting and automatic screw machines	30,078	15,559
Knee and column type milling machines	10,934	13,299
Other milling machines	32,788	50,546
Gear-cutting machines	11,439	68,713
Vertical drilling machines	2,367	24,911
Radial drilling machines	5,936	1,575
Other drilling machines	12,706	69,786
Planers and shapers	38,901	45,686
Surface grinding machines	36,474	57,672
External cylindrical grinding machines	45,353	54,182
Internal grinding machines	78,210	18,910
Tool grinding, cutter-grinding and universal grinding machines	33,914	82,823
Other metal grinding machines	79,860	77,744
Sheet and plate metal working machines	486,045	226,764
Forging machinery	45,699	170,626
Rolling mill machinery	113,017	28,135
Foundry and molding equipment	144,488	53,070
Other power-driven metal-working machinery and parts	311,154	590,695
Other metal-working machinery	198,602	388,542
Pneumatic portable tools	85,161	65,741
Other portable and hand- or foot-operated metal-working machines and parts	64,276	47,648
Chucks for machine tools	8,503	8,862
Machine operated pipe and thread cutters, stocks, dies and taps	.....	124,576
Other metal-working machine tools	40,662	141,715



Helical gear set which operated 886,226 car miles on a car of West Penn Railways since Feb., 1915. First of its type used for railway service, it has given three times average service. It was made by Westinghouse

A.M.A. Plans Two February Conferences

A personnel conference and office management conference will be held at the William Penn Hotel, Pittsburgh, Pa., Feb. 15-17, under the auspices of the American Management Association. Subjects include "Personnel Management of the Last Decade, an Appraisal," "Human Fatigue in Industry," "College Graduates in Business," and "Reducing Office Expense." Included in the program also are several round tables, including such subjects as "What Is Happening to Employees' Savings," "Job Analysis, Rating Plans, Job Classification, Developing Lines of Promotion," "Regularization of Employment," "Employee Training," "Selection of Employees."

New York Conference Scheduled on Safety

A Greater New York Safety Conference will be held at the Hotel Pennsylvania, New York City, Feb. 24 and 25, under the auspices of the Metropolitan Chapter, American Society of Safety Engineers, The Engineering Section of National Safety Council and forty-seven cooperating organizations, its general purpose being to discuss the needs for and methods of creating increased interest in organized safety work on the part of executives, supervisors and others and for the further development of a practical, progressive program of accident prevention. An exhibition of accident prevention equipment and safety educational material will be held during the conference and will be open each day from 9 A.M. to 6 P.M. A general session the first morning will take up "Safety—An Executive Policy," "Safety—An Essential to Efficient Production," and "The Safety Engineer—An Advisory Agent." Four simultaneous sessions that afternoon will discuss "The Eye—Its Relation to Safety," "Stevedoring," "First Aid," and "Curing the Accident Habit." An informal dinner will be held that evening. The next day's program begins with four simultaneous sessions on "Commercial Vehicle," "Conference of Inspectors," "Health and Safety," and "Plant Housekeeping," and in the afternoon four simultaneous sessions on "Commercial Vehicle," "Accident Facts," "Public Utilities," and "Industry's Interest in Safety Outside the Plant."

Mechanics Group Meets June 23-25

The Second National Meeting of the Applied Mechanics Division, A.S.M.E., is to be held in New Haven, Conn., June 23-25, according to an announcement by J. M. LESSELLS, secretary. The meeting will be held simultaneously with a meeting of the American Physical Society and some joint sessions will probably be held. PROF. G. B. PEGRAM is the new chairman of the division, to succeed A. L. KIMBALL, who retired to an associate member of the committee. PROF. E. O. WATERS, of Yale University, has been appointed to the executive committee to replace Mr. Kimball.

Pratt & Whitney Holds Mid-West Tool Demonstrations

Pratt & Whitney Co., Hartford, Conn., have just completed a series of demonstrations through the Middle West on the newest electric gaging methods. C. V. JOHNSON of the Hartford factory was in charge. Four demonstrations were held, in Chicago, Rockford, Milwaukee, and Davenport (Iowa). Mr. Johnson demonstrated the principle of the "Electrolimit Gage" which uses a magnifying electric circuit, making errors visible in a highly magnified form. Besides explaining the function of the new gaging device Mr. Johnson showed and demonstrated its application as both an external and internal comparator for bench use. He also demonstrated its use in continuous gaging as applied to rolling mills, paper mills, etc. Other standard Pratt & Whitney gages were also on display.

BUSINESS ITEMS

Articles of incorporation have been filed in Indianapolis by Machine Products, Inc., Lafayette, Ind. The corporation has an initial capital stock of 1,000 shares having no declared par value and is formed to manufacture and sell machinery and other equipment. The first board of directors is composed of W. G. THOMAS, JOHN F. DEWEY and CLARA L. DEWEY.

Fry Equipment Corp., Fort Wayne, Ind., has been opened by the Wayne Co. The plant makes equipment for garages and filling stations and recently was moved from Rochester, Pa.

Transfer of the foundry of Globe American Corp. from Macomb, Ill., to Kokomo, Ind., has been announced. W. Dow HARVEY, president, said several cars of machinery and equipment would be moved immediately. The Macomb plant will not be closed, but all foundry work will be concentrated in Kokomo. The company manufactures stoves and ranges.

Production Increases

Minneapolis-Moline Power Implement Co. is increasing production in its structural steel and machine plant division. This follows closely on the statements of the Soo Line, Great Northern, Milwaukee & St. Paul and other railroads that they have called back to work over 500 men since the first of the year. Electric Machinery Mfg. Co., Minneapolis, to handle construction of 12 large synchronous motors ordered by the City of San Francisco, has placed several additional men on the payroll.

About 150 men returned to work in the brass foundry and wheel department of Lenoir City (Tenn.) Car Works in January after a 3-week lay-off.

Elgin National Watch Co. has returned to a full four-day-week schedule after operating only five half-days a week since Sept. 1, 1931.

Otis Elevator Co. has received the award of the first 26 elevators for the Radio City project in New York.

Fire

The engineering laboratory building of DeForest Radio Co., Passaic, N. J., was destroyed by fire Jan. 22.

Sales Offices

Kalman Steel Corp. has moved its St. Paul, Minn. sales office from 1112 Builders' Exchange Bldg., to E-1422 First National Bank Bldg.

Philadelphia Gear Works, Inc., has leased space in the McGraw-Hill Bldg., at 330 West 42nd St., New York City, for its New York office.

Minnesota Mining & Mfg. Co., St. Paul, will institute an unemployment benefit plan for employees, benefits ranging from $7 a week to $17.55, payable for from 10 to 17 weeks a year, according to the length of service and the wages normally received. The company manufactures sandpapers, emery cloths and surface-coated abrasives, and has 700 employees with an annual payroll of about $1,250,000. Employees eligible for benefits must have been with the company for at least three years and must receive not to exceed $45 a week. They must participate in the company's old age pension and group insurance plans. Benefits begin after the third week of continuous unemployment. In the case of part-time work which does not pay as much as the relief would amount to, the difference will be paid from the benefit fund.

Canadian Plants

Canada Carriage & Body Co., affiliate of the Cockshut Plow Co., Brantford, Ont., has completed arrangements for a plant at Brantford for the manufacture of lines made by Anthony Co., Inc., Streator, Ill., manufacturers of the Anthony pipeless hydraulic hoist and dump truck hitherto imported from the United States and distributed in Canada by Canada Carriage & Body Co. Enlarged factory accommodation and machinery have been provided.

John C. Virden Co., Cleveland, Ohio, manufacturer of electric lighting fixtures, is establishing a Canadian branch factory at Toronto, John C. Virden Co. Ltd., to be headed by JOHN C. VIRDEN, president of the parent organization. Factory and office space have been leased in the Beardmore building on Front St., and some 50 hands will be employed when production starts.

Electric Vacuum Cleaner Co., Cleveland, Ohio, has made arrangements with its Canadian subsidiary, Premier Vacuum Cleaner Co., Ltd., Toronto, whereby the latter will manufacture the product at the rate of 1,000 machines a month for export in addition to the quantity now being made for domestic consumption.

Universal Cooler Co., Ltd., Chicago, manufacturer of refrigeration units and other cooling, ventilating and heating devices, has taken a ten-year lease on the Brantford (Ont.) Specialty plant at West Brantford and will employ about 65 men.

Representatives of aircraft and aero engine manufacturers in Canada recently waited upon Premier Bennett and asked for further aircraft purchases by the Government. They stated that $5,000,000 had been invested in the industry by eleven companies.

Canada Iron Foundries, Ltd., has opened a new department in the plant at Three Rivers, Que., to make valves for water pipes.

• PERSONALS •

BRIG. GEN. SAMUEL MCROBERTS, O.R.C., prominent banker and during the World War in charge of contracting for all weapons and munitions used by the American forces, became a peacetime "dollar-a-year" man Jan. 24, when he was sworn in as district chief of the New York Ordnance District, U. S. Army. General McRoberts, appointed to his new post by MAJ. GEN. SAMUEL HOF, chief ordnance officer of the Army, succeeds COL. JAMES L. WALSH, O.R.C., recently appointed executive vice-president of the Guardian Detroit Union Group of Detroit, who has held the office since 1923. General McRoberts' record as a military officer began in November, 1917, when he was appointed a major in the Ordnance Department, and then a Colonel in the National Army in connection with the procurement of ordnance munitions. He became chief of the Procurement Division with the direction of the contracts of all ordnance material used by the U. S. forces. In August, 1918, he was appointed Bridadier General and served in France until after the Armistice. He was awarded the distinguished service medal by the U. S. and the decoration of Chevalier of the Legion of Honor by the French Government. After his discharge from the Army, he accepted a commission in the Army Reserve as a Brigadier General of Ordnance. The area of the New York Ordnance District extends north to Hudson, N. Y., and south to Kearny, N. J. The office furnishes manufacturers with the necessary information to develop special plans to facilitate promptly their change from peace to war manufacture and to prepare facilities to produce ordnance munitions promptly upon declaration of a national emergency.

MAX AMS, president of Max Ams Machine Co., Bridgeport, Conn., has also assumed complete direction of sales. All sales offices have been consolidated at Bridgeport and all correspondence after Feb. 1 should be addressed to Bridgeport, Conn. JULIUS BRENZINGER continues as vice-president in charge of development and product and in addition has full direction of the factory.

EVERETT D. GRAFE has been elected first vice-president of Joseph T. Ryerson & Son, Inc., Chicago, and ROBERT C. ROSS and HAROLD B. RESSLER have been elected vice-presidents. Mr. Ross, who has been assistant to the president, was elected also to the board of directors.

A. J. ANDERSON has been elected president of Forest City Bit & Tool Co., 1206 Kiswaukee St., Rockford, Ill. Other officers are: CHAS D. GRAHN, vice-president; FRED PETERSON, secretary; ELLEN E. ANDERSON, treasurer.

WINTHROP BRAINERD, vice-president of Canadian Industries, Ltd., has been appointed to the board of Building Products, Ltd. Mr. Brainerd is a director of the parent and subsidiary companies of Canadian Industries, Ltd.

FRANCIS G. ECHOLS, president of the Greenfield (Mass.) Tap & Die Co., resigned Jan. 22, and is succeeded by CHARLES N. STODDARD. Mr. Echols became president two years ago. Previously he was vice-president and general manager 11 years, and had been connected with the small tools department of Pratt & Whitney Co., Hartford, 25 years. Mr. Echols will continue as a member of the advisory board.

WILLIAM J. FILBERT, controller of U. S. Steel Corp., has been made vice-chairman of the finance committee, ranking second only to MYRON C. TAYLOR, as a power in the world's largest industrial enterprise.

CHARLES K. FOSTER has been appointed president of Dominion Radiator & Boiler Co., Ltd. JOHN SKINNER will be vice-president and general manager. DOUGLAS J. MACDONALD continues as vice-president in charge of manufacturing and ROY J. BEATTY as vice-president and treasurer.

EDWIN HODGE, JR., has been elected chairman of the board of Pittsburgh (Pa.) Forgings Co., and F. D. FOOTE, vice-president, has been elected to succeed him as president. R. A. MITCHELL, recently in charge of operations, has been elected vice-president.

HAROLD F. MCCORMICK, ALEXANDER LEGGE, CYRUS H. MCCORMICK, GEORGE A. RANNEY, A. E. MCKINSTRY, JOHN P. WILSON and JUDSON F. STONE have been appointed members of a new finance committee for the International Harvester Co., Chicago, to supersede the executive committee. Mr. McKinstry was elected first vice-president, a post which had been vacant previously for two years. Mr. Ranney, vice-president and treasurer, has been made vice-president in charge of sales. SYDNEY G. MCALLISTER has been made vice-president in charge of manufacturing to succeed CYRUS MCCORMICK, JR., resigned. C. F. BIGGERT has been made vice-president in charge of raw materials operations, including the Wisconsin Steel Co. W. M. REAY, vice-president, will have charge of purchasing.

ROSS H. MCMASTER, president of the Steel Co. of Canada, has been elected a director of Dominion Bridge Co. Mr. McMaster also includes among his directorates the Bank of Montreal; the Canadian Pacific Railway; Consolidated Mining and Smelting; Canadian Industries, Ltd.; Canadian Bronze and Northern Electric Company.

J. H. SCHUMANN has been elected chairman of the board of Hilo Varnish Corp., 42-60 Stewart Ave. near Flushing Ave., Brooklyn, N. Y. He had served as president since 1910. CARL J. SCHUMANN, formerly secretary, has been elected president. He entered the business in 1905, as assistant factory manager. EVERITT J. COLE, director of the company and formerly chief chemist until his appointment last November as industrial sales manager, has been elected secretary. ALBIN G. SHUMANN, vice-president, JOHN H. MILLS, vice-president, FRANK M. SCHUMANN, treasurer, were re-elected. The company is a manufacturer of industrial finishes.

RICHARD F. STRAW, associated with the Wright Mfg. Co. since the War, has resigned his position as sales manager to become president of American Kron Scale Co., manufacturer of heavy-duty automatic dial scales, which has recently been reorganized under the name of "The Kron Company," at which time the plant was moved from New York City to 1720 Fairfield Ave., Bridgeport, Conn. Other officers include F. W. DE FOE, vice-president and H. C. STEVENSON, secretary and treasurer. Board of directors consist of ERNST OHNELL, chairman, T. A. YAWKEY, F. W. DE FOE, RICHARD F. STRAW and H. C. STEVENSON. GEORGE A. NICHOLS, New York Manager of Wright Mfg. Co., has also resigned to become associated with the company in an executive capacity.

Operating

KENT R. BURT has been appointed general manager of Consolidated Wagon & Machine Co., Salt Lake City, to succeed C. G. WRIGHT, resigned. Mr. Burt was formerly with Deere & Co., serving 21 years as the firm's representative in Salt Lake, with his offices with the Consolidated Wagon & Machine Co.

P. H. DESROSIERS, formerly managing director of Joliette Steel, Ltd., Province of Quebec, has been appointed general manager of Sorel Steel Foundries, Ltd. This company, recently reorganized, was formerly Beauchemin & Sons, operated and controlled by Consolidated Marine Companies, Ltd.

D. L. LAMB has been appointed general superintendent of the Lennox Furnace factory, Marshalltown, Iowa, the position having been created after decision to adopt this control of plant operations. MERRITT GREENE, for the past five years factory manager at the plant, has resigned, effective Feb. 1, and will return to the canning industry, with which he had been identified 17 years before resigning vice-presidency of the Marshall Canning Co. in 1927 to join Lennox concern.

ALGOT J. E. LARSON, general superintendent of Art Metal Construction Co., Jamestown, N. Y., has been elected president of the Manufacturers' Association of Jamestown, succeeding NATHAN M. WILSON. Mr. Larson has served four years as chairman of its executive committee.

MEAD F. MOORE, in charge of the engineering division of the Milwaukee plant, Nash Motors Co., Kenosha, Wis., from the time it was established in 1922 until it was consolidated with the main works in Kenosha, has been appointed chief engineer of the Nash works in Racine, Wis. He succeeds N. E. WAHLBERG, who was recently elected vice-president in charge of all engineering for Nash.

H. D. THOMAS has been appointed assistant to the general works manager, Westinghouse Electric & Mfg. Co. He is being advanced from the position of director of manufacturing stocks, which appointment was received in September,

1929. He has been connected with Westinghouse since his graduation from Purdue University in 1910, first in the repair department, then in the circuit breaker and switch section, later as assistant to the manager in the Merchandising Department, and assistant general manager of the Merchandising Department.

Bachrach

FREDERICK B. HEITKAMP, sales manager of the Cincinnati Milling Machine Co., has been made general sales manager of The Cincinnati Milling Machine Company and Cincinnati Grinders Incorporated. He has been with the Milling Machine Company since 1921.

J. E. CASTER has been appointed to manage the newly opened Pittsburgh office of Cincinnati Milling Machine and Cincinnati Grinders Incorporated. After attending Purdue University, Mr. Caster went with the Cincinnati Acme Tool Co., as draftsman and machinist. In 1916 he became affiliated with Cincinnati Milling Machine Co., as tool designer, engineering specialist and special milling machine engineering representative. In 1925 he was transferred to the development and sales work on Cincinnati centerless grinders, and in 1929 was named assistant sales manager of Cincinnati Grinders Incorporated. Last September he was appointed manager of the Cleveland office, which position he will hold in addition to his new work. Associated with Mr. Caster in the Pittsburgh office, with headquarters at 2737 Koppers Building, will be KARL G. KECK, CARL G. LILJEBERG, R. S. HOHNHORST and E. M. LEVINE.

C. B. TROWBRIDGE, formerly engineer in charge of sales for the Chicago office, Mead-Morrison Manufacturing Co., East Boston, Mass., has joined the staff of Canadian Mead-Morrison Co., Ltd., Montreal, as sales manager.

EDWARD LEE IVES, vice-president of H. A. Brassert & Co., and A. M. Byers Co., Pittsburgh, and president of Open Hearth Combustion Co., Chicago, has been elected a director of Chicago Gulf Corp., natural gas company.

WILLIAM F. ANGUS, vice-president of Canadian Car & Foundry Co., Ltd., and PAUL F. SISE, president of Northern Electric Co., Ltd., have been appointed directors of Montreal Trust Co.

G. J. COMSTOCK, director of research of Firth Sterling Steel Co., McKeesport, Pa., spoke on "Cemented Tungsten and Tantalum Carbides" at the Jan. 21 meeting of the Hartford (Conn.) Engineers Club.

• OBITUARIES •

JAMES E. ADAMS, 45, general manager of the M. W. Kellogg Co., Jersey City, N. J., died in Newark, Jan. 22 of heart disease.

SMITH H. BRACEY, 73, railroad contractor who built Chicago's first elevated railroad and parts of many leading American railroads, died in West Philadelphia, Pa., Jan. 24 of bronchial asthma.

WILLIAM E. CALLAHAN, 48, chief engineer for American Cyanamid Co., Linden, N. J., died Jan. 25 at his home in Elizabeth, N. J., of effects of a paralytic stroke.

SAMUEL S. EVELAND, 63, inventor, founder and first president of Standard Roller Bearing Co., Philadelphia, died recently. He had been head of a Philadelphia engineering firm in Philadelphia.

ALEXANDER GALLINGER, 87, inventor of a differential gear, died Jan. 21 at Oshkosh, Wis.

ARON J. HELFRECHT, 40, chief engineer of Burgess Battery Co., Madison, Wis., died Jan. 23 after a 10-day illness. He joined C. F. Burgess Laboratories, Inc., in 1915, after graduation from college, went to the battery manufacturing subsidiary in 1917, and became chief engineer there several years later.

ALAN F. HILTON, metallurgist, Farrell Foundry & Machine Co., Ansonia, Conn., died there Jan. 24 after a 10-day illness.

WILLIAM B. JOHNSON, for many years superintendent of the drop forge department, Nash Motors Co., Kenosha, Wis., died Jan. 18. He joined the forerunner of Nash Motors Co. in 1910.

JOHN F. KYES, 76, treasurer and manager of Reed Foundry Co., Worcester, Mass., from 1901 until 1912, died Jan. 25 at his home in that city. Mr. Kyes retired in 1912. He was a director of Reed-Prentice Co., Sanford Putnam Co., Worcester Taxi Cab Co., and Worcester Collateral Association.

CHARLES TALBOT PORTER, 46, president of Keystone Aircraft Corp., Bristol, Pa., and grandson of Charles Talbot Porter, an originator of the high-speed steam engine, died in Philadelphia, Jan. 22. Mr. Porter also organized Hoff-Daland Airplane Co., at Bristol, and became its chief engineer, secretary and treasurer. He was chief engineer of Keystone for eight years.

THOMAS SCOTT, 70, who was for 35 years superintendent of the United Shoe Machinery Co. of Canada, died at his home in Montreal Jan. 20.

HERBERT SLACK, president of Wentworth Radio Corp., Hamilton, Ont., largest Canadian radio and auto supply company, died in a hospital there Jan. 25 after an appendix operation.

EUGENE W. SMITH, 73, general superintendent of iron and steel foundries of Crane Co., Chicago, and with jurisdiction over the company's foundries at Bridgeport, Conn., Birmingham, Ala., Montreal, Canada, and Chattanooga, Tenn., died Jan. 19 at Oak Park, Ill., after a short illness. He was the second oldest living employee of Crane, having been continuously identified with the foundry for nearly 60 years.

W. C. SPAULDING, former president of Truck Engineering Co., Cleveland, died recently at Fort Wayne, Ind., where he had lived for the last ten years. He organized the company about 1915, and when it was purchased by International Harvester in 1921 and moved to Fort Wayne, he went with it in charge of division operations.

SIR ALFRED YARROW, 90, famous British engineer and shipbuilder, died Jan. 24. He was a pioneer in designing high-speed vessels and also claimed to be the first person in Britain to build and drive an automobile—a steam car. He built the steam car in 1861, when he was 19. It was capable of dashing along the highway at fully 25 miles an hour. One night, as he roared down the road with smoke and flames belching from the stack of the vehicle, he encountered a mounted policeman whose horse threw him and broke his leg. The incident led to an act of Parliament under which mechanical road vehicles had to be preceded by a man on foot bearing a red flag. He began work at 15 as an apprentice to a firm of marine engineers at Poplar, near London. He later founded Yarrow & Co., Clyde.

• MEETINGS •

THIRD INTERNATIONAL PATENTS EXPOSITION
Philadelphia (Pa.) Convention Hall, Feb. 1-10.

AMERICAN MANAGEMENT ASSOCIATION
Packaging, packing and shipping exposition, Palmer House, Chicago, Ill., Mar. 7-12, 1932. W. J. Donald, managing director, Room 602, 225 West 64th St., New York, N. Y.

FOUNDRY AND INDUSTRIAL EXPOSITION
Also 36th annual convention, American Foundrymen's Ass'n. Philadelphia Municipal Auditorium, May 2-6. C. E. Hoyt, manager, American Foundrymen's Ass'n., Inc., 222 W. Adams St., Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS
Annual meeting, Atlantic City, June 20-24. R. E. Hess, assistant secretary, 1315 Spruce St., Philadelphia, Pa.

NATIONAL MACHINE TOOL BUILDERS ASS'N
Third National Machine Tool Show. Cleveland (Ohio) Municipal Auditorium, Sept. 10-17. Boyd Fisher, general manager, 1415 Enquirer Bldg., 617 Vine St., Cincinnati, Ohio.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Calif., Los Angeles — Chrysler Corp., W. P. Chrysler, 341 Massachusetts Ave., Detroit, Mich., awarded contract for construction of 1 story, 300 x 850 ft. automobile assembly plant and 2 story, 60 x 100 ft. administration building at Eastland and Slauson Aves. here. Estimated cost $2,000,000. Noted January 28.

Calif., Santa Ana — Martha M. Medlock, awarded contract for construction of a 1 story, 115 x 121 ft. garage at 806 North Main St. Estimated cost $40,000. Noted December 24.

Conn., Bridgeport — J. J. Leon, 489 East Main St., will build a 1 story addition to warehouse on East Main St. by day labor. Estimated cost $40,000. Private plans.

Conn., Greenwich — Town, is having preliminary plans prepared for construction of a 1 and 2 story municipal garage at Mianus St. Estimated cost $40,000. C. W. Hubbard, 115 Greenwich Ave., Archt.

Conn., New Haven—Biking Flying Boat Co., 80 Shelton Ave., awarded contract for a 1 story, 85 x 100 ft. hangar, 25 x 75 ft. shop and 2 story office on Burr St.

Ill., Chicago—General Motors Corp., General Motors Bldg., Detroit, Mich., plans construction of an exhibition building for Chicago World's Fair here.

Ind., La Porte—Allis Chalmers Mfg. Co., West Allis, Wis., plans to re-equip part of plant at La Porte with machinery and equipment for huller manufacture using largely equipment for Birdsell Clover Hulling Co. plant in South Bend they have acquired.

Ia., Andrew—John Sommer & Son, has work under way on a 1 story, 34 x 34 ft. repair shop and service garage on Main St.

Ia., Sioux City—W. A. Klinger, 201 Warnock Bldg., has work under way for a 1 story, 50 x 150 ft. garage at West 14th and Omaha Sts. Northwestern Bell Telephone Co., lessee.

Mass., Brookline (br. Boston)—Standard Oil Co. of New York, Park Sq. Bldg., Boston, awarded contract for a 1 story service station at Harvard and Thorndike Sts. Estimated cost $25,000.

Mass., Deerfield—Deerfield Academy, Frank Boyden, Master, having preliminary plans prepared for construction of a service building. Estimated cost $200,000. Charles A. Platt, 101 Park Ave., New York, Archt. Bernard Dirks, 278 Main St., Greenfield, Consult. Engr.

Mass., Framingham—C. Fantony, 373 Waverly St., receiving bids for a 1 story, 65 x 115 ft. service garage. Estimated cost $40,000. I. Rosenblatt, 129 Concord St., Archt.

Mass., Norwood—Norwood Motor Sales, C. A. Riley, 35 Adams St., plans construction of a 1 story garage, and sales and service station. Estimated cost $40,000 to $50,000. Private plans.

Mass., Reading—Ace Art Co., 12 Gould St., awarded contract for a 1 and 2 story addition to factory. Estimated cost $40,000. Noted Janury 7.

Mass., Springfield—General Electric Realty Corp., Schenectady, N. Y., will receive bids about February 1 for a 2 story, 100 x 125 ft. sales and service station at 278 King St. here. Estimated cost $250,000. Private plans.

Mass., Weymouth—Department of Agriculture, plans construction of agricultural and industrial building. Architect not selected.

Mo., St. Louis—Kinloch Brass Casting Co., 2356 Palm St., awarded contract for a 1 story, 59 x 70 ft. factory at 2110 Howard St.

N. J., Bound Brook—J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, Archts., will receive bids about March 22, for a 1 story industrial plant here for owner, c/o architect. Estimated cost $40,000.

N. J., Elizabeth—Board of Education, 417 South Broad St., having revised preliminary plans prepared for construction of a 2 story manual training and industrial art school. Estimated cost $250,000. Architect not selected. Maturity 1933. Noted September 17.

N. J., Hoboken—Hoboken Land & Improvement Co., 1 Newark St., plans construction of a 2 story manufacturing plant and warehouse at 15th and Bloomfield Sts. Estimated cost $40,000. Architect not selected.

N. J., Jersey Cly—Prospect Sash & Door Co., 73 St. Pauls Ave., plans to rebuild a 2 story plant destroyed by fire. Estimated cost $40,000. Architect not selected.

N. J., Newark—Star Electric Motor Co., 140 Miller St., rejected bids for a 1 story, 160 x 220 ft. addition to factory on Riverside Ave. $40,000. W. H. Jackson, 1841 Broadway, New York, N. Y., Archt. Noted December 17.

N. J., North Bergen—Cylde O. Epperson, c/o North Jersey Industrial Terminal Co., 1827 Bergen Turnpike, preparing revised preliminary plans for a 2 story factory on 39th St. Estimated cost $50,000. Private plans. Noted December 3.

N. J., Trenton — State Board of Education, State House, Trenton, rejected bids for construction of a 2 story, 70 x 90 ft. shop building at New Jersey School for Deaf. Estimated cost $75,000. Guilbert & Betelle, 20 Branford Pl., Newark, Archts. Noted January 14.

N. J., Union City — Owner, c/o John G. Helmers, 147 Summit Ave., Archt., rejected bids and revising plans for a 2 story garage. Cost undetermined. Noted November 5.

N. Y., Brooklyn—J. Adler, Humboldt St. and Meserole Ave., plans to rebuild smelter works destroyed by fire. Laspia & Samenfeld, 217 Havemeyer St., Archts.

N. Y., Brooklyn—B. Greenberg, 4902 Foster Ave., having preliminary plans prepared for a 1 story, 95 x 150 ft. service garage and gas station at Hegeman Ave. and Malta St. Estimated cost $40,000. S. F. Oppernheim, 26 Court St., Archt.

N. Y., Brooklyn—F. W. Plate, 3620 Bedford Ave., plans construction of a 75 x 100 ft. service garage and gas station at 20th Ave. and 57th St. H. W. Sushan, 367 Fulton St., Archt.

N. Y., Jamaica—N. Moncreif, 110-31 153rd St., preparing plans for construction of a 38 x 100 ft. repair shop at 111th Road and 155th St. Maturity about May 1.

N. Y., Middletown—New York, Ontario & Western Ry. Co., 370 Lexington Ave., New York, plans to rebuild several shop buildings destroyed by fire. Work will be done by day labor. Carpenter and car repair shops will not be rebuilt until late November. W. C. Heidenthal, Engr. of Maintenance and Ways. Noted January 7.

N. Y., New York—Boyertown Burial Casket Co., 43 West 60th St., awarded contract for construction of a 2 story garage, chapel and showroom at Webster Ave. and 188th St. $75,000. Noted January 14.

N. Y., New York—Columbia University, J. W. Barker, Dean of School of Engineering, in charge, 116th and Broadway, having tentative plans prepared for construction of engineering school, shop and laboratory center. Estimated cost approximately $20,000,000.

N. Y., New York—Kohler & Campbell, 609 West 51st St., (piano manufacturers), revising plans for alterations to factory, 6 story, 100 x 125 ft. P. S. Parker, 119 West 57th St., Archt. Noted September 17.

N. Y., New York—Jacob Smith, 291 Minnieford Ave., will build a 20 x 49 ft. garage and repair shop at City Island Ave. and Tier St., by separate contracts. George S. Miller, 319 City Island Ave., Archt. Noted January 7.

N. Y., Richmond—Department of Hospitals, Municipal Bldg., New York, N. Y., having plans prepared for construction of a 2 story garage and repair shop here. Estimated cost $85,000. Sibley & Fetherston, 205 East 42nd St., New York, Archts.

N. Y., Valley Stream — School District 24, having sketches made for construction of school and manual training shops. Estimated cost $250,000. F. P. Wiedersum, 240 Rockaway Ave., Archt. Maturity indefinite.

N. Y., Winfield—Vincent Scuderi, 4009 82nd St., Jackson Heights, will build a 1 story, 80 x 100 ft. service garage and shop at 48th Ave. and West 70th St. here. Estimated cost $40,000. C. Stedolph, Elmhurst, Archt. Work will be done by separate contracts. Maturity indefinite. Noted January 14.

N. Y., Woodhaven — Cypress Homes, 582 Jamaica Ave., Jamaica, plans construction of a garage building and gas station at Rockaway Blvd. and West 75th St. Estimated cost $25,000. J. Baker, 9 Jackson Ave., Long Island City, Archt.

O., Cleveland—Goodyear Service Co., c/o Goodyear Tire & Rubber Co., 1144 East Market St., Akron, awarded contract for construction of a 2 story, 60 x 200 ft. service station and office at East 13th and Chester Sts. here. Estimated cost $150,000.

Okla., Oklahoma City—State Board of Affairs, Capitol, Oklahoma City, having preliminary plans prepared for a 1 story, 100 x 220 ft. warehouse and shop for equipment of highway department on 23rd St. Estimated cost $60,000. C. L. Wilson, Capitol, Oklahoma City, Archt.

Pa., Franklin—Venango Mfg. Co., subsidiary of Franklin Railway Supply Co., First and Liberty Sts., Franklin and 60 East 42nd St., New York, N. Y., plans construction of a plant for the manufacture of automobile and locomotive parts at First and Liberty Sts. here. Private plans.

Pa., Leetsdale—Alexander Reid, 331 Beaver Road, plans construction of a foundry at 360 First St. Private plans. Maturity indefinite.

Tex., Legion—U. S. Veterans Bureau, Washington, D. C., will receive bids until February 16 for construction of a 1 story, 60 x 160 ft. garage building here. Noted May 28, 1931.

Tex., San Antonio—Board of Education, Lavaca and Water Sts., will receive bids about March 1 for converting Main Ave. senior high school into vocational building at Ramona and Main Ave. Estimated cost $125,000. Phelps & DeWees, 618 Gunter Bldg., and Harvey P. Smith, National Bank of Commerce Bldg., Archts. Noted June 11, 1931.

Tex., San Marcos — Chamber of Commerce, negotiating with interests relative to erection of airplane manufacturing plant here including Grady Walker, of San Antonio.

Va., Alexandria—Ford Motor Co., Schafer Road, Dearborn, Mich., preparing plans for construction of a plant including distribution and service building, etc., here. Estimated cost to exceed $100,000. Albert Kahn, 1004 Marquette Bldg., Detroit, Mich., Archt. Noted November 26.

Man., Winnipeg—Dominion Bridge Co., Ltd., S. W. Campbell, Gen. Mgr., 702 Canada Bldg., completed plans for extensions to plant, at Empress St. and Surry Ave. Estimated cost $100,000. Noted January 14.

Ont., Toronto—Josiah Anstice Co., 97 Humboldt St., Rochester, N. Y., plans to establish a branch plant here for the manufacture of hotel and kitchen equipment. Indefinite whether company will lease and equip an exsiting plant or build.

United Socialist Soviet Russia—United Construction Equipment Industry, Div. of Soviet Government, c/o Amtorg Trading Corp., 261 5th Ave., New York, N. Y., will build a plant for the manufacture of irrigation equipment at Tashkent. Estimated cost to exceed $1,000,000. Work will be done by day labor and technical aid contracts.

Equipment Wanted

Md., Annapolis—Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until February 9 for one hardness-testing machine for Navy Yard here. Sch. 7359.

Mass., Roslindale—W. B. Cookson Inc., 6 Corinth St.—single spindle ball bearing shaper with or without motor.

Mich., Detroit—Gladwin Park Realty Co., 2512 Buhl Bldg.—crane, marine railway and equipment for proposed 1 story, 100 x 225 ft. machine shop and boat yard at Detroit River and Waterworks Park.

N. H., Portsmouth—Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until February 9 for two motor driven toolmakers precision lathes for Navy Yard here. Sch. 7368.

Pa., Philadelphia — Depot Quartermaster, Marine Corps, 1100 South Broad St.—will receive bids until February 8 for two hydraulic heavy-duty presses and two gear riveting and punch attachments. Req. 1423.

R. I., Newport—Bureau of Supplies & Accounts, Navy Department, Washington, D. C.—will receive bids until February 9 for two motor driven tool and cutter grinders for Navy Yard here. Sch. 7366.

Tex., San Antonio—Board of Education, Lavac and Water Sts.—machinery and equipment for vocational building at Romona and Main Ave. $125,000.